

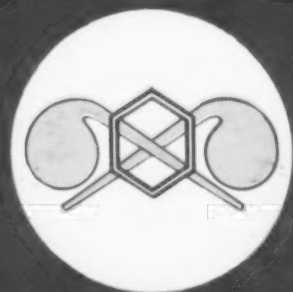
Vol. 17 No. 2

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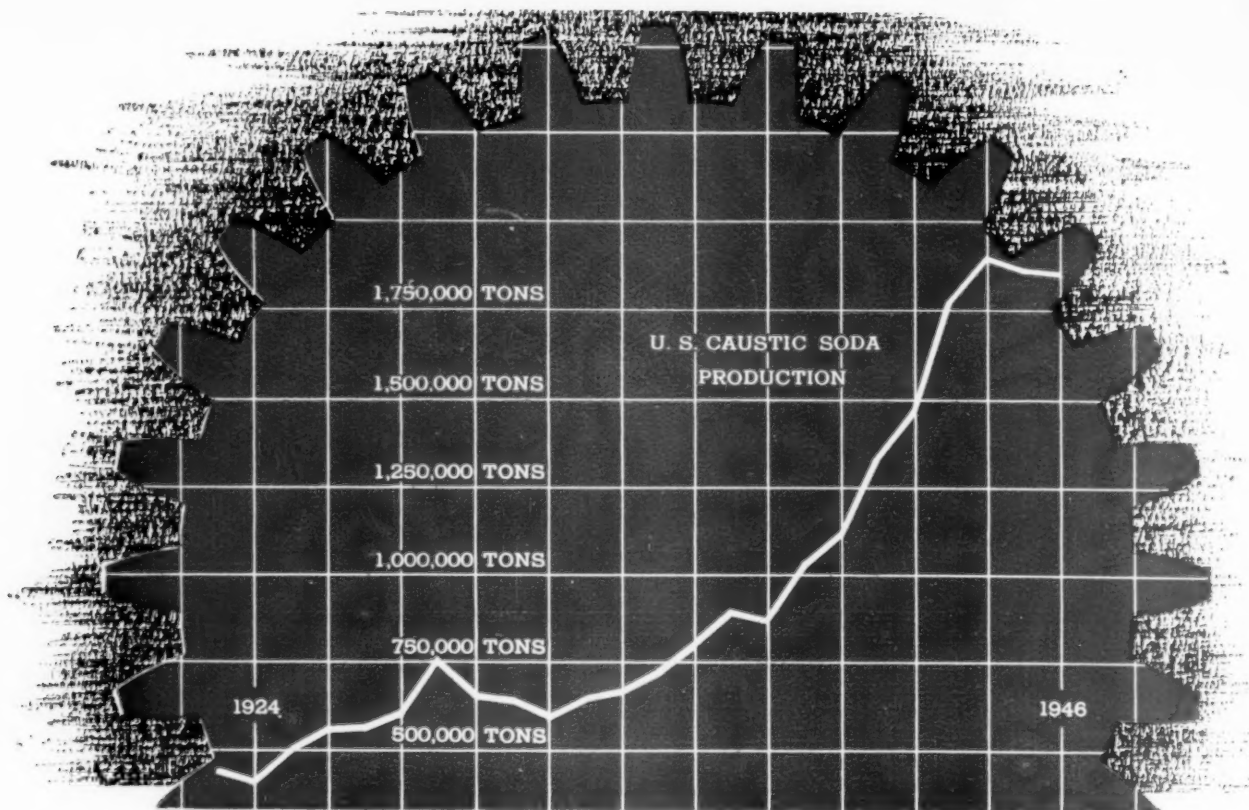
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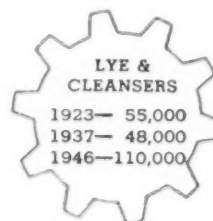
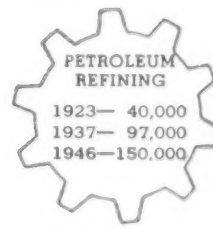
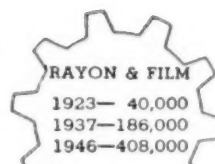
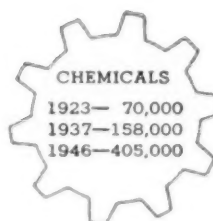


In gear with American Progress

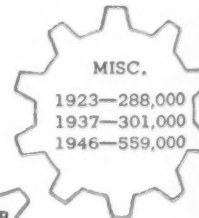
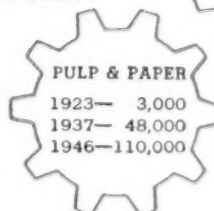
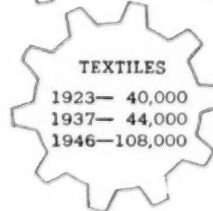
The huge increases in volume and the vastly superior quality of American production of Paper, Rayon, Textiles, Chemicals, Soap, Petroleum and numerous other essentials are reflected in the records of alkali manufacture. Caustic Soda, for example, is identified with basic processes in all of these industries. Its production figures are indicative of the close ratio to those of leading American industries.

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Chemical Corps Journal

OFFICIAL PUBLICATION OF THE CHEMICAL CORPS ASSOCIATION

Room 206, Burton Bldg., 928 5th St. N.W.

Washington 1, D. C.

Lt. Col. HAROLD B. RODIER, CmlC, Ret., Editor

Vol. II

OCTOBER, 1947

No. 2

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THE PICTURE ON THE COVER

The first Secretary of the Army, Hon. Kenneth C. Royall, has shown himself keenly appreciative of the mission of the Chemical Corps and sympathetic to its problems.



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"... to sponsor new developments designed to increase the efficiency of chemical warfare means, to collect and disseminate useful knowledge with respect to chemical warfare and related subjects, to foster a spirit of good will and cooperative endeavor among its members and with industry, and to perpetuate the friendships, memories and traditions growing out of their service with the Chemical Corps . . ."

The Chemical Corps Association

COL. LUDLOW KING, *President*
1031 Investment Building
Washington, D. C.

CAPT. JOSEPH SCHWIMER, *Cml. Res., Sec'y-Treasurer*
Room 206, 928 Fifth Street N.W.
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HOWARD L. SHINE LIEUT. MARY WARNER, *CmlC*

Vol. II

OCTOBER, 1947

No. 2

THE DIRECTORS' MEETING

The meeting of the National Directors of the Chemical Corps Association in New York on September 18 was an important milestone in the life of the Association. The readiness with which these men, most of them top executives in leading firms in the chemical industry, gave of their time to attend this meeting was an index to their serious interest in our organization and its purposes; their questions, their comments and suggestion an impressive expression of that interest. Exemplifying, as it did, the interest of the chemical industry generally, it was an inspiring and invigorating experience for your Association officers.

From here on out we can go forward in executing the program of the Association with renewed assurance that we have the moral backing and the active, practical assistance of the industry.

Our Association has been handed important assignments from the Corps and from higher levels in the Department of National Defense; it has been indicated that these assignments will increase in numbers and importance. Our capacity to execute such assignments has been proven and this capacity is expanded by the success of our Directors' meeting. And from it we have received increased strength and courage for the important tasks that lie ahead of us.

LUDLOW KING,
National President

EMPLOYMENT DEPARTMENT

The Association proposes to set up an employment service for the mutual benefit of employers and those seeking employment.

Employers in the chemical or allied industries are requested to publish their employment opportunities in the *Journal*, and members seeking employment are urged to solicit the type of employment they seek through its columns. There will be no charge, to members, for either service; and replies may be channeled through the *Journal* if desired.

It is strongly urged that in each case the most detailed information about the jobs offered or sought be supplied. Within reason no specific limit on space will be set, so that time of all concerned may be saved by supplying complete information initially.

Following is the solicitation for employment of our first "customer":

CHEMICAL ENGINEER: B.S. Ch. E. 1941. Ex-

Army officer, CWS, desires responsible position in process development or production. Six years' responsible experience: Plant development, operation, maintenance, pilot-plant, trouble-shooting, including administrative and supervisory. Shift superintendent, Lewistite Division, Rocky Mountain Arsenal; Chemical Munitions Development Officer, Edgewood Arsenal. Army patent applied for. Available immediately. Married. Address Employment Dept., Chemical Corps Association, Burton Bldg., Washington 1, D. C.

PERSONNEL CHANGES

Lt. Col. Carl S. Casto, Commanding Officer, Chicago Chemical Procurement District, has been assigned to Student Detachment, Headquarters, First Army, Governors Island, New York, with station at Harvard University. Maj. Frederick J. Hurley has been named as Commanding Officer, Chicago Chemical Procurement District vice Lt. Col. Castro.

Col. Horace McP. Woodward, Jr., Theater Chemical Officer for the European Command, who recently returned to the United States, will assume the duties of Commanding Officer, New York Chemical Procurement District, upon completion of his leave, on or about 15 October 1947.

Replacing Colonel Woodward as Theater Chemical Officer for the European Command is Col. Milton T. Hankins.

Chemical Corps Association

Defines Objectives

Has the Chemical Corps Association got a job that it is capable of doing, and that is worth doing in the estimation of the people from whom we solicit membership or support? This is a question which our members and supporters may, and should, ask of those charged with the conduct of the Association's affairs. The answer is, decidedly, "Yes"; we do have a mission that is practical and of genuine importance. For the information and guidance of all who are interested, the objectives of the Association are here defined and set forth.

The Chemical Corps Association has been established for the achievement of the following objectives:

1. To perpetuate the spirit of comradeship which was so great a factor in the success of our Corps, and to keep alive the memory of our honored dead.

2. To associate together in a single, cohesive organization, a great body of citizens, allied with the chemical industry through background, experience, vocation or interest; and dedicated to the cause of our National Defense.

3. To maintain an unbroken liaison between the Chemical Corps, its former personnel, military and civilian, and the chemical industry; preserving lines of communication and personal contact between these elements.

4. To stimulate and maintain the interest and enthusiasm of its membership in matters relating to our National Chemical Defense.

5. To keep its membership informed of the activities and technical progress in Chemical Warfare subject to the limitations of security.

6. To supply, through its *Journal*, a medium for the publication of technical and educational articles pertinent to the interests of the Corps and our membership.

7. To provide a medium through which the wealth of technical and military experience of its

associated members may be made available and integrated with National Defense activities as their services and their counsel may be required.

8. To maintain national and local committees on Research and Development which will set up projects, assigned by the Corps or initiated from within, for study, evaluation and report to the appropriate body. Such activities shall be maintained at whatever level of security the Corps shall direct.

9. To maintain national and local committees on Industrial Mobilization which shall set up appropriate projects for study, evaluation, report and action; and which shall be available to the Department of National Defense for the execution of any missions assigned to it.

10. To maintain national and local committees on Military Education which shall study and appraise the current training programs set up for inactive military personnel and to make pertinent recommendations thereon.

11. To provide a medium through which the Corps and the Chemical Industry may communicate informal information and queries, without formality or delay, whenever such a channel may seem desirable or expedient.

12. To support and contribute to the National Defense in each of the many ways possible to the patriotic, enthusiastic and talented body of citizens who comprise the Association.

Directors Meet in New York

By JOSEPH SCHWIMER
Secretary-Treasurer

The first combined meeting of the Directors-at-Large and the Directors of the Chemical Corps Association was held on Thursday, 18 September, at the Cloud Club, Chrysler Building, New York City, and from all sectors of the nation comes word that the session was successful from all angles.

Primarily the meeting was called to discuss the Association's participation in the Industrial Mobilization Plan for the United States, and secondly, to acquaint the directors with their colleagues.

Col. Harry A. Kuhn, USA, Ret., presented the mobilization operation with a tie-in of facts of figures relating to the chemical industry. His story appears elsewhere in the *Journal*.

Apart from the industrial preparedness phase, discussion was held on the reserve officer program, which to date has many a good officer in the throes of a dilemma. There was no comment concerning the fact that if the Army is dreaming of a potent reserve force, nothing has been done to this day to give the majority of the reserve officers in the Chemical Corps the essentials of a concrete program. Our President, Ludlow King, assured the directors that any suggestions received would be passed along to the proper authority.

Undoubtedly, one of the important reasons why the reserves are handicapped when called to active duty is the fact that the War Department has over-classified much of its information, and it was pointed out during the discussion that unless the reserves, as well as industry, are kept informed on developments in peace as in war, M-Day will find us educating officers and industry all over again.

Several directors pointed to the lack of coordination within the Armed Services in which one company might be asked to serve by three or four technical services without receiving the know-how, where or when it is going to cooperate. One director stated he hoped that the Association is strong enough financially to help in keeping the country prepared from a chemical angle both in offense and defense, as well as to correct the duplication of effort now apparent.

The successful meeting far exceeded the expectations of the Executive Committee, and therefore, the time for more discussion was cut

short. However, it is planned to hold a similar meeting either at Edgewood or in Chicago just prior to the third annual meeting of the Association. Minutes of the session will be duplicated and forwarded to Chapter Secretaries for presentation to the immediate session of the local unit. Comments are invited.

The following attended the meeting:

Carroll C. Adams, President, Boston Chapter.
Herbert K. Bear, Past President, CCA, Philadelphia, Pa.

Clarence W. Crowell, Rochester, N. Y.
Paul Bauman, President, Baltimore Chapter.
Dr. Willard H. Dow, President, Dow Chemical Co.

W. H. Chamberlain, Washington, D. C.
C. D. Clawson, President, Ferro Enamel Co., Cleveland, representing Mr. Robert Weaver.

Russell Greer, Vice President, Pemco Corp., Baltimore. Director, Area of Maryland.
William J. Harshaw, President, Harshaw Chemical Co., Cleveland.

Edward Hansen, Cleveland, Ohio, Chapter.
Charles E. Bronson, Atlanta Chapter.
S. Willard Jacobs, Vice President, Niagara Alkali Co., New York City.

Dr. H. F. Johnstone, Dept. of Chemistry, University of Illinois.
O. O. Kenworthy, President, Cleveland Chapter.

Dr. Walter R. Kirner, Vice President, Chairman of Research and Development Committee.
Kenneth H. Klipstein, Assistant General Manager, Calco Chemical Div., American Cyanamid Co., Bound Brook, N. J.

H. C. Knight, Edgewood Chapter, Army Chemical Center, Md.

Dr. Walter E. Lawson, Development Dept., duPont Co., Inc., Wilmington.

Col. Harry A. Kuhn, Vice President, CCA.
Ludlow King, President, CCA.

Alex Leggin, Vice President, Chairman Publications Committee, American Chemical Society, Washington, D. C.

Jerome J. McGinty, President, New York Chapter, CCA.

R. M. Marshall, President, Pittsburgh Coke & Chemical Co.

William J. Orchard, President, Wallace & Tiernan Products, Inc., Belleville, N. J.

Col. Charles E. Loucks, Chief Research and Development, Chemical Corps, Army Chemical Center, Md.

(Continued on page 51)

Mobilization—Chemical Industry

COL. HARRY A. KUHN, U.S.A., Ret.
First Vice President, Chemical Corps Assn.

It is very appropriate that the Chemical Corps Association is being used by the Army and Navy Munitions Board as a channel to industry in planning for industrial preparedness. One of the main objectives of this Association is to bring together industrial concerns and individuals interested in the chemical and allied industries as a part of national defense.

In 1938 the Undersecretary of War requested Mr. E. M. Allen, District Chief, N.Y.C.W. Procurement District, to organize a Chemical Industry Committee of the Army & Navy Munitions Board to advise on plans to mobilize the chemical industry to meet military needs in war. The pioneer work of this committee and its fifteen subcommittees in 1939-40 was invaluable when, after Pearl Harbor, the demands for hundreds of chemicals for direct and indirect military use skyrocketed beyond any previous plans or estimates. During World War II industrial chemical production reached and maintained for almost two years an index of 400—base period 1935-39=100, whereas the index for *all* industrial production for the same period was 240. The chemical industry can be proud of this record but it also emphasizes the vital role of chemicals in the production of implements of war. A comprehensive industrial mobilization plan can only be built if we have a sound chemical mobilization plan as a foundation.

A sound chemical plan needs accurate estimates of needs, both direct and indirect, kept up to date with the research and development of the weapons of the next war and assurance of the availability of the technical personnel to produce. A sound plan must be national in scope to insure dispersal in case of extensive bombing. It should be prepared largely by the industry.

At least two thirds of the munitions of World War II were produced in government financed plants; plants designed and built as the Army and Navy requirements grew. The government spent 17 billions and private industry 6 billions in new plants, expansion and conversion from 1940-1945; but it took two years of war before our munitions program was ready for full scale warfare. Initially, it was the private industrial plants and the partially completed prewar industrial mobilization plans that started and kept the supplies rolling. *Can we wait two years in World War III?*

The chemical industry was expanding to meet civilian needs—many essential to our domestic economy, when the war began. The full war load had to be met by new plants and expansion of existing ones. Excluding almost one-half billion dollars in rubber chemicals the government financed two and one-half billions of dollars of increased chemical capacity; one billion of this for explosive and chemical warfare chemicals, the balance for industrial chemicals. That the industry was able to furnish the technical skill to staff this 100 percent expansion is an example of the versatility of the industry—and the cause of a lot of grey hairs in the management today!

Leaving history, what is the situation today? We are producing more essential basic chemicals today than at the war peak. Chlorine is an essential war, as well as civilian, chemical. Today we are producing at the rate of 4,000 tons per day against a war peak of 3,200 tons per day. By the end of the year an additional 400 tons per day of chlorine will be available. Sulfuric acid is a similar example—today we are producing at the rate of almost 900 thousand tons per month—at least 10 percent higher than our wartime peak.

A further favorable factor in the chemical mobilization planning is the relatively high percentage of the three billion dollars of government financed chemical facilities being used commercially today. According to the latest figure the WAA has leased or sold chemical plants costing over 400 millions and the War Department has leased all or part of chemical facilities costing over 540 millions. Since a considerable portion of the War Department facilities are still being used for government purposes the record of utilization of our wartime chemical plants in the peacetime economy of the country is excellent.

Current thoughts on the possible scope and intensity of a future war more than ever means that industrial mobilization plans be based on current data; production plans on current capacity and processes. The chemical industry knows best how it can most quickly meet military requirements once they are known to them. Integrated industrial committees who have the full confidence of the industrial mobilization planning agencies established by the National Defense Act must be set up to help lay the broad plans for industrial mobilization. It is vital that the basic

(Continued on page 51)

General Waitt Addresses Graduating Class

Maj. Gen. Alden H. Waitt, Chief, Chemical Corps, in his address to the graduating class of approximately 168 Chemical Corps Reserve Officers who completed the refresher course at the Army Chemical Center, Maryland, on 5 September 1947, discussed the plans which are being formulated for the training of Reserve Officers and the proposed promotion policy.

"In the Plans and Training Division of my office we have prepared and will submit to the War Department a Chemical Corps plan for training which embodies policies and actual programs that the Army Ground Forces may use in the training of Reserve Officers . . . Essentially our plan proposes that our Reserve Officers be divided into three main groups—Troops and Staff, Technical Manufacturing and Inspection, and Supply and Procurement. Training appropriate to each of these groups will be provided when the number of Chemical Corps Reserve Officers warrant it within an area; we are asking that the Chemical Corps Section of a composite unit be divided into these three main groups, and that they be given special projects that are appropriate to their general type of assignments. We plan to prepare tailor-made training programs and schedules for each group. This is, of course, necessary because of the varying types of experience and education," said General Waitt. He continued, "The plan that we have submitted, even if it is approved, isn't the last word or the final solution. It is going to take some time to work out a proper scheme of training. We need your help and will welcome your suggestions and constructive criticisms."

With regard to the plan for promotion, General Waitt stated, "There has recently been submitted to the War Department General Staff Committee on National Guard and Reserve Policy a long range promotion plan for officers of reserve components. Again this is strictly a proposed plan and must not be construed as final or approved. This plan is a revision of one submitted in February of this year. Briefly, the outline sets forth the following: (a) minimum time in grade; (b) maximum age in grade, distinguishing between officers in combat type assignments and others; and (c) maximum time occupying a grade. The maximum time in the various grades has been made to conform with the maximums applicable to the regular army under the recently enacted law pertaining to regular army promotions. Such a provision is considered essential to prevent stagnation in grade. (d) Promotion of Second Lieu-

tenants without regard to vacancies after two years in grade if they have completed professional requirements, or in three years provided they have completed three years at that time.

"As an example of age and time in grade requirements . . . for non-combat type officers:

	2d Lt.	1st Lt.	Capt.	Major	Lt. Col.	Col.
Minimum Time-in-Grade for Promotion	2	3	5	3	4	
Minimum Age at Appointment	21	23	26	31	34	38
Maximum Age at Appointment†	27	31	36	45	51	55
Maximum Age-in-Grade	30	34	41	48	55	60
Maximum Time-in-Grade	3	7	7	7	7	5

†If appointed originally in that grade.

The age requirements for combat type officers are somewhat lower, especially in the higher grades.

"As far as the application of credits for inactive and active duty training toward promotion is concerned, that part of the promotion plan is still being studied in the War Department General Staff and by the Committee on National Guard and Reserve Policy."

General Waitt stressed the importance of maintaining a Reserve Corps in his closing remarks: "All of us believe in the Reserve Corps. We understand its importance. We know how much we must rely upon a strong civilian component in our national defense."

MANPOWER EXPERTS TO ASSIST IN INDUSTRIAL MOBILIZATION PLANNING

Studies of war manpower problems have been initiated by the Army and Navy Munitions Board.

Results of the studies, prior to being submitted to a war manpower advisory committee, which will be representative of labor, management, agriculture and government, will be examined and commented upon by the Army and Navy Munitions Board War Manpower Consulting Group. The war manpower advisory committee will be organized after the studies have been developed into tentative plans and operational procedures.

The newly organized War Manpower Consulting Group will meet periodically, aiding the Board in completing its current manpower studies. Manpower is one of the major components of the industrial strength of the United States. From its study of the subject, the Board will derive policies to incorporate in the U. S. Industrial Mobilization Plan. It is anticipated that the manpower studies will be completed sometime in 1948.

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By discovering and putting to work the unused potentials in the earth's common and abundant materials, chemical research and manufacture constantly are contributing to *human* as well as *economic* progress.

This is the aim of chemistry.

And it is not neglected at American Cyanamid, where each year sees new advances and developments from basic chemical research—the “unfinished business” from which our industrial and scientific progress springs.



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MOLDING THE FUTURE THROUGH CHEMISTRY

The Affiliation Program and the Chemical Corps

The *Affiliation Program* being actuated by the War Department is designed to provide for certain key service type units of the Organized Reserve, manned and equipped to enable their rapid and efficient transition from a peacetime to a wartime basis. These affiliated units are technical or specialized type units of the Organized Reserves which are sponsored by those civilian organizations performing a function in civilian life as closely allied as possible to the unit's military assignment. The units will be maintained on an inactive status with personnel furnished, insofar as possible, from officers and employees of the sponsoring organization.

The affiliation principle is not new and was used successfully to a limited extent in World Wars I and II. The present program is new in that it will be the first time that the affiliation principle has been coupled on a major scale with the Organized Reserve Corps. In the past war, service units organized in the civilian fields of medicine, transportation and communication—such as complete hospitals, trucking and railroad companies—were able to contribute their know-how, developed in their everyday work, to the Army at a time when such skills were vitally needed and the nation could not afford extended training periods.

Under this program the Chief, Chemical Corps is charged with the responsibility of negotiating and completing the affiliation agreements with selected industrial concerns. Upon completion of the agreement, the activation, organization and training of the affiliated units becomes the responsibility of the Army Ground Forces through the appropriate Army Area Commanders. The Chemical Corps units in this affiliation program include Maintenance, Depot, Service, Laboratory, Decontamination, Smoke Generator, Processing, Air Operations Companies and Chemical Service Platoons.

In order to cooperate to the best advantage with the Army Area Commanders in the implementation of the plan, the Chief, Chemical Corps, has delegated the task of completing the affiliation agreements to the several Chemical Procurement Districts and has assigned to each the responsibility for those proposed units which lie within the geographic boundaries of that district.

The total number of service units of all types in the Army at its peak strength shortly before

V-E Day was well over 20,000. It is planned that the present program will result initially in the affiliation of 2,500 key service type units. Not all affiliated units will have assigned a full complement of officer and enlisted personnel. Authorized strength limitations and budgetary considerations serve to fix the number of fully manned units to be organized in the Reserve Corps.

Affiliated units will be of three classes: A, B and C. As a minimum all key individuals of a unit will be furnished by the sponsor. Where limited personnel make it necessary, available reservists not employed by the sponsor may be assigned to a unit with the sponsor's approval.

Class "A" units will be full strength with full complements of officers and enlisted men assigned. In the event of an emergency each Class "A" unit will be able to take to the field and function successfully in its assigned mission after a short period of additional training.

A Class "B" unit is one organized with a full complement of officers and a cadre of key enlisted men. In the event of mobilization, these units will be given their filler personnel through the selective service system or from bulk reserve personnel.

Class "C" unit consists of a full complement of officers only. In event of mobilization they will be given their filler personnel through selective service or from bulk reserve personnel.

All affiliated units will be activated initially in a Class "C" status. Units earmarked for advancement to Class "B" and Class "A" may do so when found qualified.

To qualify for initial recognition, an affiliated unit must have available a qualified unit commander and at least 60 percent of authorized officer strength. The sponsor of an affiliated unit will be required to furnish the maximum possible number of officer and key enlisted personnel required by the unit's Table of Organization. Where a sponsor's limited personnel resources make it necessary, available reservists not employed by the sponsor may be assigned to an affiliated unit with the approval of the sponsor. Sponsoring organizations may "adopt" a unit already organized. Such action may be indicated, for example, where an appreciable number of employees of a sponsoring organization are

already members of an organized unit of the Reserve Corps.

The commanding officer of an affiliated unit will be selected from among eligible reserve officers by mutual agreement between the sponsor and the War Department. The commanding officer must be acceptable to the headquarters command responsible for activation and training of the unit.

An affiliated unit must have assigned a minimum of 80 percent of commissioned officers and 80 percent of enlisted cadre or key enlisted personnel to advance to Class "B" status, and 80 percent of commissioned personnel and 40 percent of total enlisted strength to advance to Class "A." *Prior to assignment all enlisted personnel must have voluntarily applied in writing for such assignment.*

The mission of the training program for affiliated units will be to prepare them to operate effectively as elements of the Army of the United States following mobilization. There will be made available to the sponsor a choice of combination armory type training and/or summer field training from the following (within availability of funds):

- a. Weekly armory type training periods plus 15 days of summer field training for Class "A" units.
- b. Twice monthly training periods plus 15 days summer field training for "A" & "B" units.
- c. Monthly training periods plus 15 days summer field training for "A," "B" & "C" units.
- d. Monthly training periods with no summer field training for "A," "B," and "C" units.
- e. Quarterly training periods and no summer field training for "A," "B" and "C" units.

The quantity and type of *home training equipment* issued to affiliated units will vary considerably depending upon the type of unit and its status; that is, "A," "B" or "C." Copies of tables showing home training equipment authorized for various types of Organized Reserve Corps units will be made available to an interested organization when such organization is contacted by a War Department representative. *Field training equipment* will be available to a unit upon arrival at a training area.

Individuals and sponsors accrue direct advantages as a result of participation in the affiliation program. The individual is likely to perform military duties for which he is best qualified. Consequently, skills developed in civilian occupation will be retained and developed instead of being impaired through disuse. Further, he will perform such duties in the company of his peacetime buddies. Membership in an affiliated unit affords opportunities for more rapid advancement than can be expected by those who

are drafted into the service during an emergency. The sponsor, knowing what individuals he can expect to lose following mobilization is in a position to plan for their replacement. Further, the sponsor can reasonably expect that upon demobilization returning members of affiliated units will not only possess skills previously developed in civilian specialties, but that such skills will have been further developed in military service.

Affiliated units have the advantage of insuring efficient and speedy utilization of technically qualified personnel in assignments similar to those performed in civilian occupation. The association in a military reserve unit of individuals accustomed to each other through association in a civilian organization tends to make for a high efficiency and esprit de corps. *TIME* will be at a high premium in the initial stages of any future emergency and there may not be available to use the time required to organize and train certain key essential service type units. In view of the ever-increasing importance of the time factor in the early days of modern wars, *the availability of effectively organized affiliated units will be a vital factor in another emergency. It is imperative that the event of an emergency find us at a maximum state of readiness for immediate mobilization.*

CC SELLING SURPLUS CHLORINATED PARAFFIN

The Chemical Corps is presently storing in depots and arsenals 2,500,000 pounds of surplus chlorinated paraffin which should be removed as early as possible. Approximately 5,000 55-gallon steel drums, specification 5A, in good condition, hold this material. The bulk of this material is located at Huntsville, Ala.

Chlorinated paraffin has the following uses: (a) Fabric impregnation for rendering material pliant and flame resistant; (b) plasticizer for protective coatings; (c) used in synthetic rubber, plastics, inks and adhesives manufacturing.

The specification No. 4-503-127 under which this material was purchased is as follows: (a) Total chlorine, min. 41%, max. 46% by weight; (b) free of suspended matter and sediment; (c) acidity as HCl—maximum 0.004%; (d) color—not darker than No. 5 Union Colorimeter; (e) free chlorine—no color with starch iodide; (f) water, max. 0.1% by weight.

Copies of the specification are available for inspection. The Association is now preparing a list of prospective bidders to whom invitation to bid forms will be mailed as soon as preparations for the sale are completed.

Colonel Stubbs Becomes R. & E. Deputy

Colonel Marshall Stubbs was appointed Deputy Chief, Research and Engineering Division, and Major Claude W. White, appointed Executive Officer, in an announcement made recently by Colonel Charles E. Loucks, Chief of the Research and Engineering Division at the Army Chemical Center, Maryland.

Research and Engineering Division directs and coordinates the research and development program of the Chemical Corps. It is one of the four major divisions under Major General Alden H. Waitt, Chief of the Chemical Corps.

The research program in addition to the work done on chemical agents includes the developments of smoke, incendiary, weapons and munitions, protective devices and all counter-measures in these fields.

Colonel Marshall Stubbs, a West Point graduate, holds a master's degree in Chemical Engineering Practice from the Massachusetts Institute of Technology.

Colonel Stubbs was awarded the Legion of Merit, Bronze Star, Army Commendation Ribbon and 5 Battle Stars to the European Theatre of Operations Ribbon during World War II for service overseas in England, France, Belgium and Germany from April 1943 to May 1947.

He has served eighteen years in the Regular Army, twelve of which have been in the Chemical Corps.



MAJOR CLAUDE W. WHITE



COL. MARSHALL STUBBS

Major Claude W. White holds a BS degree in chemistry from Virginia Military Institute and a master's degree in chemical engineering from Ohio State.

He spent fourteen months overseas in the ETO with the 14th Armored Division and 3rd Army Headquarters in France and Germany during the past war and returned to the United States in November 1945.

Major White was commissioned a permanent first lieutenant in the Chemical Corps of the Regular Army in March 1947.

WAR DEPARTMENT TO LEASE NIAGARA CHEMICAL PLANT

The chemical warfare division of the War Department is offering for lease the premises at 3163 Buffalo avenue, Niagara Falls, N. Y., according to an announcement made by Col. W. F. Heavey, district engineer, New York. The plant was formerly occupied as an industrial plant by the division, and is said to be suitable for small scale manufacturing of specialty chemicals. Bid forms and information can be obtained by writing to the real estate division, Corps of Engineers, 120 Wall Street, New York 5. Sealed bids will be accepted until 2 p.m. October 20.



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Ferro's War Story

This is the first in a series of articles from our industrial members requested by the Editor.

By G. H. MCINTYRE
Vice President, Director of Research, Ferro
Enamel Corporation

The story of Ferro's production during World War II is typical of American industry in the war effort. Peacetime producers of inorganic (vitreous enamel) and organic (plastic-Vedoc) coatings for washing machines, stoves, refrigerators, signs, sanitary ware, and the like, the loss of markets with Pearl Harbor was sudden and 90 percent complete. Some production of porcelain enamels was continued for war housing, canteens, heat resistant coatings and other special war needs. The organic coatings were soon converted to the olive drabs required for finishing war materiel.

Never a large manufacturer of chemicals, Ferro nevertheless was well staffed with trained chemists, chemical, ceramic and mechanical engineers because the products of manufacture and the general research problems of the company were closely allied with chemistry and chemical engineering involving processes of grinding, mixing, high temperatures and accurate control of raw materials as well as processes on a large scale. This naturally allied Ferro to munitions production requiring such experience.

Thermite

Chemical Warfare Service issued the first contract in the summer of 1941 for thermite on lend-lease. Production was soon begun in Cleveland and continued on an ever-expanding scale, especially after the entry of the United States into the war, until VJ-Day, 1945. During this time a total of over 61,000,000 pounds of thermite were manufactured in Ferro plants, built and supervised by Ferro personnel in Cleveland, Ohio; Birmingham, Ala., and Modesto, Calif.

A continuous process of roasting iron scale received in bulk from various steel mills, screening, blending and packaging was developed. Careful specifications of burning rates were met without difficulty.

Briefly, the rod and mill scale was unloaded from freight gondolas onto a continuous belt which distributed the crude scale into storage bins. From here the scale was conveyed by power shovels to a skip hoist which fed a continuous rotary furnace. This preliminary roasting oxidized all grease and dirt, putting the scale



DR. G. H. MCINTYRE
Vice President, Director of Research, Ferro Enamel Corp.

in a loose and free-flowing condition. The cleaned crude scale passed over a scalping screen to remove large chunks of iron and other foreign material and then into a counter currently heated rotary cement-type kiln for oxidation. This kiln was 60 feet by 8 feet diameter and was fired with an oil burner located 20 feet from the discharge end. The hot waste gases were discharged through a series of baffles to drop their heavy dust burden. The last 20 feet of the kiln beyond the burner was not lined and was water cooled by water dripping over the outside of the steel shell. Flights carried the scale through the kiln under strongly oxidizing conditions. Oxidation was completed to less than 17 percent FeO.

The cooled and oxidized scale was discharged into receivers and conveyed to a series of sizing screens which separated the product into several fractions. It was not necessary to grind the scale to obtain sufficient quantities of the various fractions needed.

After testing each fraction for proper degree of oxidation, the iron oxide was delivered to the

mixing room where it was put together in a mixture with aluminum of correct specifications to produce thermite. From the mixer the finished thermite was loaded into 100-pound paper bags, sewed and immediately conveyed to a waiting box car for shipment to the various arsenals.

Adequate samples were taken and tested at all stages to insure the product's meeting all required specifications.

While the manufacture and handling of this high temperature incendiary was considered hazardous, no troubles of a serious nature ever were encountered.

Calcium Silicide

The grinding of calcium silicide on a large scale for smoke mix was the next important item put into production. After several near disastrous starts (including one serious explosion), a method of continuously grinding in an atmosphere of dry nitrogen and screening in an atmosphere of dry carbon dioxide was successfully employed. No danger existed as long as the oxygen content of the atmosphere was maintained below 10 percent. By keeping the oxygen at 8 percent or below, a good safety factor was utilized.

The nitrogen was introduced from cylinders through a manifold, pressure gauges and valves. The carbon dioxide was generated from dry ice placed in a pressure cylinder heated by electric strip heaters. The flow was regulated through pressure valves and flow meters. The mill and screens operated at atmospheric pressure. The precautions were effective in reducing fire and explosion hazard, as was evidenced by several small spontaneous dust fires which started on the outside of the grinding and scumming sequences being checked by the low oxygen content of the surrounding atmosphere in these steps of the process.

The powdered silicide was stored in steel drums.

Some 545,000 pounds of this powder was prepared during the winters of 1942-43 and 1943-44.

Smoke Mix

Chemical smoke mix was manufactured at ever-increasing rates from February 1943 until VJ-Day in 1945. New plants were built and operated by Ferro in Cleveland, Ohio; Birmingham, Ala.; Crooksville, Ohio, and Modesto, Calif. Loading plants were also operated in Birmingham.

The first production was of the PN83 type, an intimate mixture of hexachlorethane, powdered calcium silicide and dry zinc oxide. There was little apparent hazard involved in this process since the mixture is slow burning, difficult to ignite and no particular troubles had been previously encountered.

In constructing the first production unit at

Cleveland, Ohio, all precautions for adequate control of dew point, mixing and material handling were provided to insure maximum quality of product as well as speed of manufacture. All factors were completely satisfactory from the start. Some 900,000 pounds of this mixture had been made with no difficulty until 3:05 p.m. on August 2, 1943.

The afternoon shift of eight men had reported for work as usual at 3 p.m. The mixer was being discharged and material had been gathered on the loading platform over the Ransome Mixer for the next charge into the mixer. At 3:05 p.m., without warning, a flash explosion occurred at the mixer sending a sheet of flame throughout the entire building. The explosion was of low order as evidenced by only a moderate bulging of the walls of the building and little damage to windows. However, all personnel were severely burned from waist to feet, much of their clothing being burned off. All but the man on the mixing platform ran from the building and were immediately hospitalized. The man on the platform died instantly. By early morning of the next day all personnel who had been exposed to the flash explosion had succumbed.

Careful investigation indicated clearly that the explosion initiated within the discharge chute of the mixer. Many experimental tests were conducted to duplicate cause of the spontaneous flashing of the mix, but without success. All operations at the Cleveland plant were then discontinued.

As the demand for chemical smoke mix powders increased with the advent of the war, Ferro production units were installed at Birmingham, Ala.; Modesto, Calif., and Crooksville, Ohio. On October 4, 1943, an explosion of high velocity occurred in the Birmingham plant, injuring 11 and killing three. Investigation again failed to show negligence or exact causes.

After this second explosion the plants were redesigned to isolate mixing in explosion confining cells and personnel were fully protected by remote control facilities.

Subsequent numerous explosions at Birmingham, Modesto and Crooksville did no material harm and there were no further casualties.

Evidence strongly indicated that impurities in the raw materials present because of their forced production under wartime conditions served to catalyze the reaction of the ingredients in the mixture. Under all test conditions developed, it was impossible to flash the mix by an electric spark in a dust cloud of the mix, by friction or any means except actually raising the temperature to the combustion point.

The moral to chemical engineers is that in translating an apparently safe operation from laboratory to large scale production under forced conditions, too many safety precautions cannot be observed. After full safety measures had been provided in this case, some 55,000,000 pounds of different types of chemical smoke mix were manufactured without further serious incident.

Smoke Pots

As a corollary of the manufacture of smoke mix, a plant was built at the Birmingham location for the production of the H-5 smoke pots. This pot utilized the type "C" mix. Over 425,000 pots were assembled from this plant without special incident.

Arsenic Trichloride

Ferro chemists and engineers built and operated the only civilian plant for the production of arsenic trichloride by the then Chemical Warfare Service process. The plant was designed in its basic concepts by CWS and Buffalo Foundry. Many refinements and details were instituted through research and developments by Ferro's research staff.

Essentially, the process consisted of reacting dry arsenic trioxide with dry sulphur monochloride, distilling off the sulphur dioxide, separating the arsenic trichloride from sulphur residues by further distillation, removing these to a reactor where additional sulphur was added to make up for sulphur losses and sulphur monochloride regenerated by the reaction of sulphur and dry chlorine.

The condenser system was built of water-jacketed Pyrex tubing and gave no trouble. An interesting sidelight on the hazards of "forced draft" chemical engineering was encountered in the first operation of the system. A drain line had been provided from one of the receivers for arsenic trichloride which consisted of pumping through a pipe with a goose neck connection to an open drain. With the receiver almost full, the pump was started to determine if all was working well and immediately stopped with the first flow of arsenic trichloride. To the operator's horror he discovered that no valve had been provided and the arsenic trichloride kept right on merrily flowing through the pump and line because of the syphon that had been started.

Soon the building was full of deadly fumes which the breeze picked up and carried through a residential district for several squares. The residents began vacating their homes because of the dense white choking fumes. The flow was finally stopped by the operator donning rubber

suit, gloves and gas mask and disconnecting a flange above the liquid level.

It was necessary to flush the entire outer and inner surfaces of the building and outer surface of the equipment with water from a fire hose and repaint to stop corrosion.

The missing valve was like the misplaced decimal point—so small, yet so important!

No other untoward incident occurred in the continued production of approximately two million pounds of arsenic trichloride from September 1943 through well into 1944. The plant was finally shut down and kept in standby condition throughout the balance of the war.

Napalm

Napalm proved to be one of the most interesting and important products manufactured by Ferro during the war. The research staff entered the research program of NDRC on the chemistry and manufacturing problems related to thickening agents for gasoline in January 1943 and continued to study various phases of the problem until VJ-Day.

Production of the aluminum salt of oleic, naphthenic and coconut fatty acids (non water soluble aluminum soap) known as napalm was begun on a limited basis in November 1943 and continued with ever-expanding rate until VJ-Day. Over 8,000,000 pounds were produced for the Army and Navy. When it is realized that this is a relatively light weight, bulky material, and that this volume of napalm would thicken more than 24,000,000 gallons of aviation gasoline, it can be seen that a considerable quantity of most effective incendiary material was made available for war purposes.

Over half a million pounds of napalm were ground to a fine powder for Navy use. The grinding of this material was both difficult and hazardous. The material tends to take up moisture and to pack. Experiments showed the napalm dust to be easily ignited and highly explosive when mixed with air.

The greatest problem in the manufacture of napalm was continually to meet the close tolerances of the specifications for gelling characteristics, moisture limits and particle size distribution. As experience was gained it was found possible to hold these variables within extremely narrow limits. Napalm, when exposed to relatively dry air, tends to absorb moisture rapidly when at room temperature or slightly above. Moisture tolerances were held within ± 0.2 percent, with the average moisture content at 0.4 percent by weight.

No accidents or delays were ever met in the manufacture of this product. An efficient flow

of processes was established and continuous production schedules maintained.

Incendiary Bombs

The CWS at Firelands Plant, Scioto Arsenal, Marion, Ohio, was engaged in the manufacture of M-69, M-74 and M-76 "goop" flame bombs. Two different civilian manufacturers had undertaken the operation of the plant, but many difficulties had arisen and production was slow. At the request of CWS officers, Ferro was asked to take over this operation. Engineers designed straight-line, conveyORIZED processes and production was begun on February 1, 1945.

A total of 3,300 M-69 clusters were reconditioned and over 45,000 M-74 and 75,000 M-76 clusters were produced and shipped by VJ-Day, when operations were suspended.

White Phosphorus Starter Cups

In connection with the production of the M-74 "goop" bombs, white phosphorus starter cups were needed in large quantity. Several of Ferro's engineers were assigned to this problem and a completely new plant was designed, built and operated at Bedford, Ohio, for their production. A straight-line, continuous system was installed. Many problems of assembly, testing, safety of handling and high rate production schedules were overcome.

The cup finally adopted for production was of black plastic with screw cap sealed on after the yellow phosphorus was loaded and sealed from contact with the air by plating of metallic copper from copper sulphate solution. The loading and plating steps were carried out under water.

The cup containing the solid phosphorus was removed from the plating solution, dried, and the plastic cap screwed on and sealed with special cement.

It was then necessary to let the cups stand for 24 hours at 90-100° F. to solidify the sealing cement. The cups were next returned to the production line and heated to remelt the phosphorus, exposed to the air to detect leakers (they would show a small flame at the leak) and the good ones packaged for shipment to the arsenal. The leakers were quenched by submerging in water.

One quiet summer Sunday afternoon the town of Bedford, Ohio, was blanketed without warning by a dense white smoke screen and the fire department received an urgent call to the Ferro cup-loading plant. A bad leaker had developed in the 100° F. storage pile and before the fire was out 15,000 cups holding one-third pound white phosphorus each had gone up in smoke, with part of the roof of the factory. The building and pro-

duction line was so constructed that production was not at all delayed. The only direct loss was the 15,000 cups in process and part of the roof.

Many carloads of white phosphorus were received, unloaded, stored and placed into finished cups for the M-74 bomb. No other accident or delay was encountered in a total production of 2,200,000 cups, each holding one-third pound white phosphorus. Production began in March 1945 and continued until VJ-Day.

Silicon Powder

A plant had been designed and built at Bedford, Ohio, to produce several million pounds of magnesium and magnesium-aluminum (x-alloy) powders for ordnance. That is a separate story in itself, but Ferro also produced from early 1943 until VJ-Day without special incident some 600,000 pounds of silicon powder ground to pass a 200-mesh U. S. Standard sieve for CWS in this plant.

Research

Ferro's staff of research chemists, engineers and ceramists were closely allied with all phases of the technical problems involved in every operation for war production. In addition, many were engaged in research for NDRC, Ordnance and CWS on problems relating to napalm, arsenic trichloride, smoke mix, coating of Army canteens and blackout lamps, as well as other miscellaneous problems related to the war effort.

In closing this resume of one typical company's war effort, I would like to quote from R. A. Weaver, Chairman of the Board, Ferro Enamel Corporation:

"American industry, large and small, astonished the world—astonished itself—by the speed and quality of its war production.

"Ferro, a peacetime producer of gleaming porcelain and liquid plastic finishes (for refrigerators, sinks, stoves, ranges, bath tubs, washing machines, etc.), is proud to have taken part in this 'miracle'—proud to have furnished some of the most effective and some of the most deadly munitions of the war.

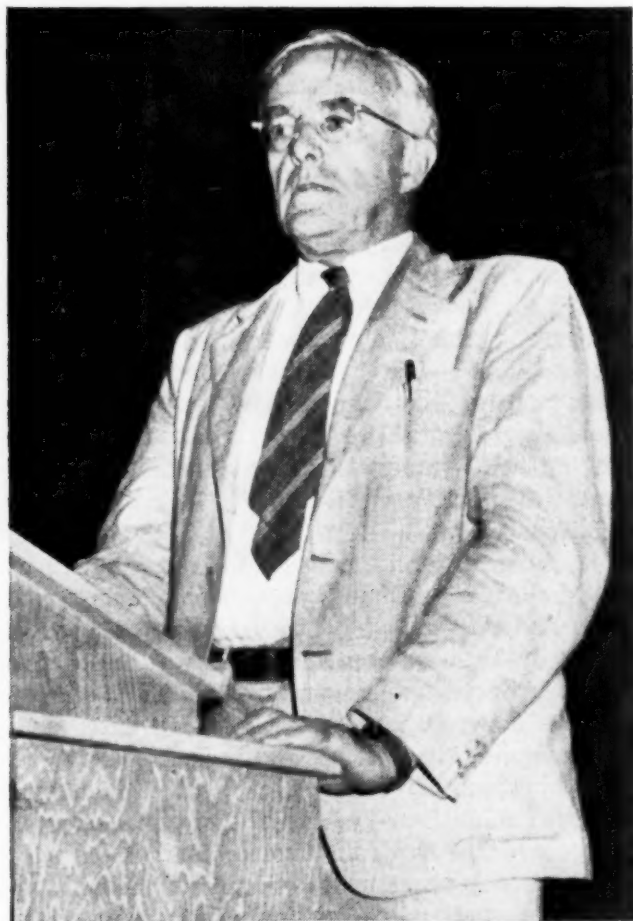
"In nine different plants, in three different states, Ferro workmen and technicians toiled night and day—most of the time seven days a week. In the 44 months of the war, no Ferro plant ever lost an hour's time—ever had a strike—ever fell down on a required shipping date.

"Managers, supervisors and technicians for all of Ferro's extensive and highly diversified war activities came from 'within the organization'—a fact of which Ferro's management is exceedingly proud. Today these men are back at their peacetime jobs, better fitted than ever to maintain Ferro leadership in a peacetime world."

Technical Command Conducts Symposium

On August 19, 20 and 21 the Technical Command at the Army Chemical Center, Maryland, conducted a symposium. The principal object of this symposium was to review, especially for the younger scientists of the Chemical Corps, the important developments in the military, medical and industrial applications of the theories evolved during the recent war.

This is in accordance with the purpose of the War Department Committee on Scientific Personnel to create a "true professional" environment in War Department research and development installations. It is part of a Chemical Corps program to promote the professional development of its scientists. Previous activities in this program include a similar symposium conducted by the Chemical Corps Medical Division in which a number of eminent outside scientists participated. There have also been two rather extensive series of lectures. These lectures and symposia are supplemented by weekly seminars by members of the staff.



DR. IRVING LANGMUIR
Nobel Prize Winner, addressing Technical Command Symposium

The symposium furnished an opportunity for some 70 invited scientists to gather and discuss problems and the basic scientific principles involved with Chemical Corps scientists. The discussions and exchange of ideas and information proved to be stimulating and valuable.

The meeting was opened by Col. John A. MacLaughlin, Commanding Officer, Technical Command, who introduced Brig. Gen. E. F. Bullene, Commanding General, Army Chemical Center; Col. Charles E. Loucks, Chief, Chemical Corps Research and Engineering Division, and Mr. Wilson Greene, Scientific Director of the Chemical Corps Technical Command, for brief introductory talks. The meeting was then turned over to Dr. Rudolph Macy, Chief, Chemical Division of the Chemical Corps Technical Command, to conduct the program.

REORGANIZATION OF SUPPLY AND PROCUREMENT DIVISION

Effective 13 August 1947, the Supply and Procurement Division was reorganized as follows:

Supply and Procurement Division (at Washington, D. C., and Army Chemical Center, Maryland). Supervises storage, preservation and issue of Chemical Corps supplies; exercises technical supervision over those supply and depot storage agencies which are subject to technical supervision by the Chief, Chemical Corps; computes basic requirements of Chemical Corps items and spare parts; supervises procurement, production, maintenance, industrial mobilization and procurement planning for the Chemical Corps, and computes basic requirements for personnel and funds therefor; directs the Chemical Corps property disposal and base maintenance programs.

Three branches have been set up under this Division, namely, Supply Branch, Procurement Branch and Property Disposition Branch.

Also on 13 August 1947 the Central Salvage Unit, New York Chemical Procurement District, was redesignated Central Salvage Section (NYPD), OC, Chemical Corps, and its personnel, records and functions transferred to the Property Disposition Branch, OC, Chemical Corps. Station and administration of the Central Salvage Section (NYCPD), OC, Chemical Corps, remain with the New York Chemical Procurement District.

Philippine Chapter Formed

Within the shadows of the historic fortress of Corregidor aboard FS Boat 18A, the Philippine Chapter of the Chemical Warfare Association was formed this year.

Realizing the need of closer association of Chemical Corps officers stationed in the Philippine Islands, Lt. Col. Clarence B. Drennon, Jr., Chemical Officer, Philippines-Ryukyus Command, arranged for a boat trip from Manila to historic Corregidor and Mariveles, Bataan, from which the infamous death march of 1942 started. Invitations were sent to all Chemical Corps officers in the Philippines and twenty-five officers made the trip.

After sailing from the small boat Basin, off Dewey Boulevard, Colonel Drennon called all officers forward for the purpose of discussing the formation of a Philippine Chapter of the Association in order to bring about a closer association of the officers stationed in the Philippines, improve the morale of the Chemical Corps officers and advance the Chemical Corps activities in this theater. Colonel Drennon further explained the object of the Chemical Warfare Association and requirements for membership. All personnel enthusiastically endorsed the proposition to organize a chapter. Thus aboard an FS boat sailing across Manila Bay was a new chapter born with twenty-five charter members.

After discussion, Colonel Drennon was made temporary chairman and nominations of officers were made. After written secret ballots the following officers were elected: Lt. Col. C. B. Drennon, Jr., President; Lt. Col. M. Q. Dannetelle, Vice President; Lt. C. M. Shadle, Secretary-Treasurer; Lt. Col. R. C. Mottley, Major John W. Boyd, Major Earle N. Wester and Lt. Wm. T. Carney, Directors.

The following officers were present and became charter members: Lt. Col. Z. A. Lawhon, Major D. V. S. Kirkpatrick, Major C. D. Miller, Capt. G. C. Nowers, Capt. R. C. Lewis, Capt. D. I. Saunders, Capt. A. E. Isch, Capt. S. A. Brown, Capt. L. M. Dellinger, Lt. James C. Gray, Lt. O. B. Cope, Lt. R. P. Delisle, Lt. M. L. Lasker, Lt. F. S. Ruby, Lt. W. A. Helwig, Lt. R. L. Wellde, Lt. Daniel Kalish, Lt. W. S. Petersen.

After arrival at Corregidor, the party boarded a 6x6 truck and toured the historic island seeing the many points of interest, including the famous coast defense batteries, Malinta Tunnel, middle side and topside installations. The cameras were kept busy during the tour.

This new chapter of the Chemical Warfare Association does not plan to be a "flash in the pan" but intends to be an active and helpful part of the National Association. Although in a foreign country and seven thousand miles from home, much can be done by the chapter in the Philippines to further the progressive development of the officers of the Chemical Corps and the Corps itself.

Plans are being formulated to have monthly meetings which will combine education and a pleasant interlude from the daily duties. To this end the first committee appointed was a meeting and entertainment committee composed of Capt. A. E. Isch, Lt. James C. Gray and Lt. W. S. Petersen. It is now proposed that at each meeting some phase of Chemical Warfare activities shall be discussed in order to have better-informed officers in the Philippines.

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Vice President in Charge of Manufacturing and Traffic,
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Men of Mars

By Major HARVEY E. SHEPPARD, CmlC

(Major Sheppard was Chemical Officer of the 5332nd Brigade (Prov) known as the Mars Task Force. This unit was especially designed as a long-range penetration force, and operated in Burma under command of Brig. Gen. John P. Willey, USA)

This is a story of a small group of American fighting men in Burma, a remote corner of the war, without very much spectacular publicity. It was the only American fighting force in Asia, other than the Air Force units, whose primary reason for existence was to kill Japs. They marched uncountable miles (estimates vary from 600 to 900) through the thickest jungle and some of the roughest terrain in the world, sweating, fighting, and some of them dying, to drive the Japs from a country that belonged to somebody else, and to help open a supply line to China.

They were called the Mars Task Force and they were designed as a hard-hitting, long-range penetration unit that could go anywhere as long as the blessed mules and the air supply held out.

One of its units, the 475th Infantry Regiment, was formed of remnants of Merrill's Marauders, veterans of the long monsoon struggle in the steaming jungles of the Mogaung and Hukong valleys. They knew the enemy well, having met him at Shaduzup, killed 500 of them at Walabum, and taken his merciless shelling cut off from the rear at Napum Ga. Myitkyina was another thing they didn't like to talk about.

The Mars Force also included the 124th Cavalry, a former Texas National Guard unit, that learned foot soldiering—and mule psychology—superbly well. The First Chinese Regiment, one of the best hand-picked units of the Chinese army, two battalions of pack field artillery, together with pack troops and medical units, made up the balance of the brigade. Its organization and movements were kept highly secret and the Japanese were continually surprised by its appearance in unexpected places, and confused by our abundant and well-organized air supply. They referred to it as "American Parachutists" and constructed elaborate defenses along the Burma Road to guard against these fighters, who never obliged by appearing in just that way. The unit's operations were instrumental in the final opening of the supply route to China and securing it from any future Japanese threat. It is not the purpose of the writer to take any of the credit from the



MAJ. HARVEY E. SHEPPARD

American engineers who made the road possible, but to mention a word for those men who traveled the hard way without benefit of jeeps, hot food or regular mail.

Each American regiment was authorized as special issue four 4.2" chemical mortars and 18 flame throwers. The Chinese regiment was authorized 12 flame throwers, but no mortars could be supplied at that time because of the demands of the 1st Heavy Mortar Regiment, a Chinese unit American trained which was then in active support of Chinese divisions driving south from Myitkyina.

The 475th had used their mortars at Myitkyina with excellent effect and added them to their 81mm mortar sections as additional weapons. This brought up training difficulties and made any definite personnel organization of the squad impractical. The training program stressed flexibility and attempted to anticipate supply problems in jungle fighting for both the 81's and the 4.2's with the limited personnel of 18 men available in each battalion section. With the special emergency issue of two additional mortars per regiment, each battalion heavy mortar section had two mortars at their disposal. The men were enthusiastic about the 4.2 mortar and willingly undertook the additional burden its use entailed. Combat was later to prove that enough faith and enthusiasm could and did accomplish the impossible.

Flame thrower assault teams were organized in each battalion P&D section as follows:

- 1—team leader (Sgt.)
- 2—F.T. operators
- 2—Asst. F.T. operators
- 2—sub-machine gunners
- 2—scouts

All men were armed with WP smoke grenades in addition to their other weapons and trained in their use. Each man was also trained in complete servicing and operation of the flame thrower.

The organization of the cavalry regiment presented new problems to the Mars Chemical Section. In addition to the 4.2 mortars, later increased to six, the 37mm gun with tripod mount had to be incorporated in the organization. Both weapons were placed in the rocket sections of the squadrons, consisting of only 12 men each. With no previous experience all of the sections attained a commendable degree of proficiency with the mortar in two weeks of effort. Observers spent many hours of their leisure time in studying fire control, which netted important results when the unit went into combat.

Flame thrower training also presented all problems of an extra T/E weapon. Four operators in each troop were trained with a team organized from riflemen in the troop. Troop problems were worked out with a platoon in support and following up with flame thrower assault.

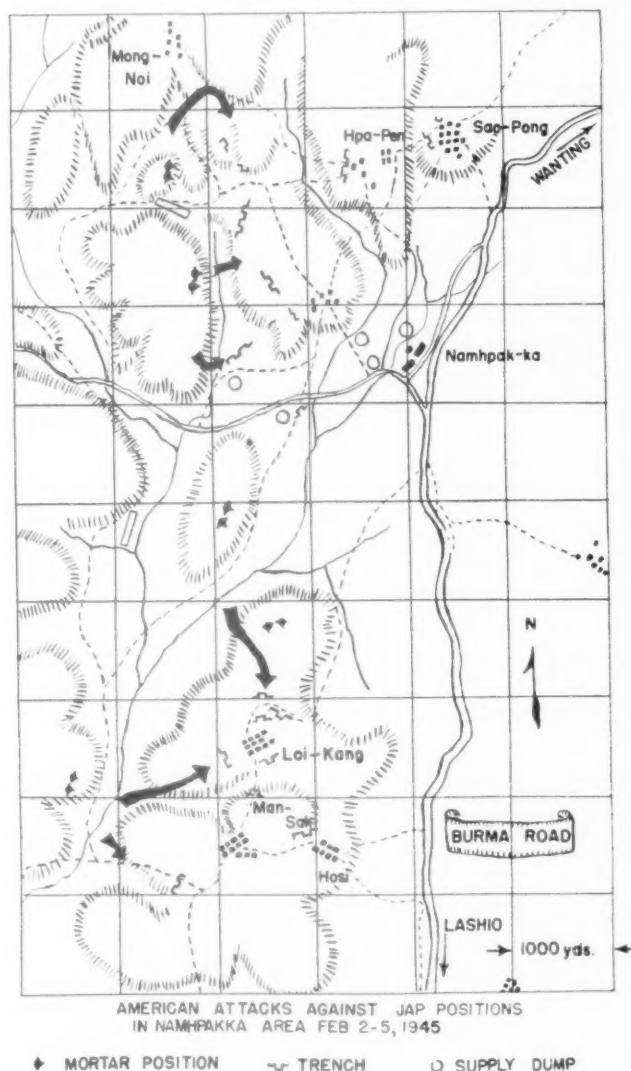
Flame thrower training with the Chinese regiment was similarly conducted. The tendency of Chinese troops to delay too long in follow-up of flame thrower operations was overcome to such an extent that it became difficult to hold them down until the flame thrower had done its work. Unfortunately higher command decision removed control of the Chinese regiment from the Mars Force and this excellent organization did not participate in later operations of the brigade.

The problem of supply was solved by air drop. Pack frames for mule transport of the mortar were not available and, although improvised packing was satisfactory for short distances, it was very impractical for the country through which the Mars Force had to operate. Ammunition carts would not be needed, but mortar carts were to be dropped with each mortar. Considerable experimentation in cooperation with the Chemical Officer of the advance section finally developed a thickened fuel that would give a satisfactory range and still be sufficiently fluid to charge the weapon without a filling kit. Flame throwers were air-dropped in pairs with three charges of fuel and extra pressure and hydrogen cylinders.

The M1A1 was the only flame thrower available.

At Tonkwa, more than 100 miles behind the Jap perimeter at Bhamo, the Mars Force drove back a Jap counterattack against a Chinese unit in the town and took over its defense. The Japs launched several attacks under the delusion that they opposed Chinese troops only to be mowed down by machine guns and their unit's first experience of the devastating 4.2 mortar fire. The advance to the south toward the famed Mandalay covered some twenty miles before they were diverted by new orders.

All mortars were turned in and returned by plane to the base depot. The change in plan involved a long march across the mile-deep Shweli River gorge, swollen by the winter rains, and over two 8,000-foot mountain ranges, the Tao-pong and Loi Lum. On these heights our water froze in our canteens, and yet the trail also led down into innumerable hot valleys of rice paddies and dense jungle.



Our mission was to seize the heights commanding the Burma Road and cut the enemy supply line to the Namhkam-Muse sector to the north on the road to China. It was good mortar country. The tumbled peaks and ridges precluded bringing anything but mule-packed 75's and limited the use of even this weapon by the abundance of sheltered coves. A great deal would depend on mortar fire in this terrain and the mortar crews were quickly cheered by the sight of their favorite weapon drifting down by parachute from cargo planes circling above.

According to preconceived plan, the 4.2 mortars and ammunition were among the first of the air drop loads when contact was made on January 22. Essential parts were hurriedly collected under Jap sniper and long range artillery fire. Carried off by cart or mule, they were hastily emplaced to help hold the thinly held line of fox holes. Positions were improved during the night and a mule string led by one man from each mortar squad built up the ammunition supply. Improvised packs were used for the mortars where it was impossible to pull a cart.

One rocket section, forced to operate bazookas and mortars at once during an attack on the heights above Saopong on February 2, did a remarkable job of close support with only five men available for the two mortars—one observer, three men firing the mortars, and another with the all-important mule ammunition trains. Over 4,000 rounds of HE and 900 rounds of WP smoke were used before the disorganized withdrawal of the Japs down the Burma Road, closely followed by the converging Chinese units from the north. Huge stores of ammunition were abandoned by the enemy at Namhpakka, the largest Jap depot in north Burma.

The Burma Road below Namhpakka was blasted repeatedly by the 4.2 mortar fire. At least one Japanese tankette was knocked out, several trucks and one ammunition dump were destroyed. Jap traffic on the road was seriously interrupted, although many by-passes were available to them. All Jap movement by day was stopped.

However, even more effective was the mortar fire on the bivouac areas, situated in deep draws. Several Jap patrols attempting to infiltrate up the deep ravines leading through our positions were broken up by accurate mortar fire. In one case, 4.2 mortar fire was placed only 50 yards in front of the perimeter with excellent fire control. WP smoke shell was effectively used to blind the Jap artillery superiority of 105mm and 150mm howitzers and to burn the jungle grass off the

hills, thereby exposing many Jap positions to the tactical Air Force and to our own 75's.

Packing of the flame throwers had been well done by the depot section and only one was damaged beyond repair by the parachute drop. Fuel arrived in good shape, sufficiently fluid to charge without special apparatus and thick enough to give us 50 yards of effective range. The Jap positions at Namhpakka were hastily dug and none of the flame throwers were used in combat other than to burn off the jungle grass, exposing several cleverly concealed positions.

After the end of the campaign a battalion commander, previously unfamiliar with the 4.2 chemical mortar, declared that it was by far the most lethal and valuable single weapon in support of their operations. To this the front line GI who felt the ground vibrate from the explosions in front of his positions breathed a fervent "Amen."

Operating the 4.2 mortar in this terrain took heart-breaking work and guts. It was done successfully by men who had never seen it until those crowded days at Myitkyina before the "long march." Most of the squads had less than 12 hours of training, including practice firing, and they had their own T/E weapons in addition. In combat they knew that, few as they were, hauling the ammo by mule from the drop field would be their responsibility. However, they learned to love the 4.2 in training, and that will largely compensate, as every soldier knows, for things that Tables of Organization, the weather, and the enemy may deny him.

COLONEL MALING TO RETIRE

Col. Edwin C. Maling will be retired from active duty on 31 October 1947 under War Department Special Orders 170 dated 28 August 1947.

Colonel Maling graduated from the United States Military Academy in 1917 and was commissioned a second lieutenant, Infantry. He transferred to the Chemical Warfare Service as a first lieutenant on 10 October 1929 and was assigned to the 1st Chemical Regiment at Edgewood Arsenal, Maryland. He attended Command and General Staff School in 1937.

Colonel Maling served in the European Theater from June 1942 to February 1945. Since his return to the States he has been Commanding Officer, San Francisco, Chemical Procurement District.

Maj. William H. Bliss is presently Acting Commanding Officer, San Francisco Chemical Procurement District.

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Training Plans of the 130th Chemical Group

By LT. COL. SELIG LEVITAN, *Cml Res*

In the organization of the Reserve Corps for inactive duty training, it has become necessary for the War Department to establish a number of so-called composite groups for the training of Reserve personnel not assigned to fill T/O positions. Some of the officers presently assigned to such groups will be assigned to Class A, B or C units as these are from time to time activated; others will be retained in the groups pending mobilization day assignments not covered in any established table of organization.

The 130th Chemical Group organized in New York City and environs area is one of such groups. Its personnel is limited exclusively to Chemical Corps personnel, although other Composite Groups include personnel from more than one arm and service. The personnel presently assigned to the 130th have had varied wartime experiences covering the entire range of Army activity. To mention but a few of such fields of experience—there are officers with combat experience in the Pacific and ETO; officers with supply and training experience in all theatres; officers with Chief's Office experience; officers from Procurement Districts, Supply Depots, Arsenals, Research and Development facilities, etc.

The Group was organized late in 1946 and during the first year of organization its training program consisted of monthly two-hour meetings, at each of which one major speaker and subject was presented; for example, General Waitt discussed the over-all plans of the Chief's Office; Colonel Loucks at one session discussed the research and development program; at another session General Groves discussed the development of the atomic bomb.

Assigned to the Group at the present time are 440 officers. Attendance at the meetings during the past year averaged 35 percent of the assigned personnel, considered good under existing circumstances, but from many officers came the following complaints:

(a) The exact mission of the Organized Reserve was unclear and ill-defined;

(b) The training program, such as it was, appeared to be largely of an academic or historic or elementary character and interest would necessarily lag as time went on.

Preliminary plans for training for the fiscal

year 1948 were based on giving a general refresher course in Chemical Warfare subjects, with particular emphasis on the duties of an officer assigned to field units. Considerable objection developed to this plan in conversation with members of the Group principally on the following grounds:

(a) Most of the officers have the subject matter sufficiently fresh in mind not to require a refresher course and urged that the subject matter would not justify the expenditure of time that would be involved; and

(b) That many of the officers in any new emergency would be assigned to research and development, procurement, supply and other mobilization tasks and therefore desired to keep current in those fields rather than in a field where their interest was apt to be very small.

From these discussions, the following training principles and postulates developed:

(1) In the absence of current assignment plans for the personnel of this Group, *for the time being*, it will be assumed that in the event of a near-term mobilization, assignments would be substantially similar to those occupied during the last period of active duty.

(2) The primary purpose of training at the present time would be to develop a professional competence to handle an immediate M-day assignment in a specific field of Chemical Corps activity. For this purpose it would be assumed that the existing mission of the Chemical Corps will continue subject only to the effects of the Armed Forces Unification Bill.

(3) As a secondary training objective, an effort should be made to give all personnel of the Group a reasonable appreciation of other portions of the mission of the Chemical Corps, besides the one field of specialization.

Accordingly, arrangements were made to develop five areas of specialized training—air*, procurement, supply, research and development and field tactics and training.

All personnel of the Group were invited to express their preferences for training assignment; in the event that no preference were expressed assignment would be made on the basis

* Since it is assumed that on or about 1 September 1947 all functions pertaining to air will be taken over by the Air Forces under the Unification Law, this portion of the program was subsequently dropped. The Air Forces have invited all Chemical Corps personnel with wartime association with the Air Forces to transfer to the Air Reserve.

of wartime experience and the judgment of the Commanding Officer of the Group. Advice was given that after an assignment was made, with the approval of the Commanding Officer, a transfer could be made from one section to another. Three solicitations were necessary to elicit responses from 50 percent of the Group, which for the purpose of further discussion can be assumed at the present time to constitute that portion of the Group actively interested in training.

In each of the fields selected, a Section Leader was chosen on the basis of his wartime experience. The Section Leaders now functioning are as follows:

Air *

Procurement—Lt. Col. Merle H. Smith

Supply—Major Timothy C. Hearne

Research and Development—Col. L. T. Sutherland

Field Tactics and Training—Col. Fraser M. Moffat

The 130th Composite Group was organized under Colonel Harold Riegelman as Commanding Officer. Colonel Riegelman has a staff consisting of S-1, S-2, S-3 and S-4. While the responsibility for organization and supervision of the training program is assigned to S-3, for practical purposes of administration it was decided that one staff member would be assigned to the general supervision of one area of training. In that way, co-ordination of the training efforts can be effected. The identity of the coordinating officer would not be disclosed to the Group as it was desired that the Section Leaders take full responsibility towards the Group for the carrying out of the training program. S-3 would coordinate among the staff members.

With the collaboration of staff members and active duty personnel in the office of the Senior State Instructor, each Section Leader undertook the development of a ten-hour detailed program for presentation during the first five months of the training year.

In each subject, an effort will be made to train on a professional basis with a view towards qualifying an officer to immediate assignment in his field of interest. In other words, it is planned, for example, in the procurement activity actually to study the process of effecting procurement from the time a requirement develops until delivery is effected. The officer should end the ten-hour training period with familiarity with the paper work process involved. It is presently planned to rotate the Groups so that in due course of training each man will have gone through forty hours of instruction; each man will have had the

primary training of his own group and will also have gone through a course of instruction to orient him in the activity of the other groups. Interspersed among the section meetings, there will be bi-monthly meetings of the entire 130th Group at which will be presented subjects of interest to the entire group. These subjects will cover, for example, reorganization of the War Department following Unification, the impact and effect of U.M.T., the organization of the new infantry division, proposals for development of airborne units, organization and plans for combined operations, organizations and planning for disaster control, etc.

On the whole response to date has been enthusiastic. The Section Leaders have all gotten down to work and have developed quite detailed plans for their activities. Each has chosen from his own group several people who will collaborate with him actively in the conduct of the training problem. In some instances, Section Leaders have obtained two weeks active duty assignments which have afforded them opportunity for implementation of their programs. Certainly social contacts within the individual sections will be very much improved as a result of this program.

The key point in the development of the program is the selection of Section Leaders with an adequate degree of ability and enthusiasm to undertake the necessary work involved in the preparation of their subjects.

The foregoing describes in general the plans for training of the 130th Chemical Group for the next training year. Its success will depend upon the maintenance and willingness on the part of the Section Leaders and their key personnel to spend a considerable amount of time and effort in developing, planning and executing the program. Its success will depend too upon the cooperation received by the Section Leaders from the Chemical Corps itself. Will we have the necessary training doctrine, the necessary literature, the necessary training aids, to facilitate our instruction and to make that instruction current? A third factor will be the speed with which the Chemical Corps develops mobilization assignment plans for personnel assigned to Composite Groups. I cannot urge too strongly upon the Chemical Corps the desirability of having its own mission crystallized at the earliest possible date and proceeding immediately thereafter to issue M-Day assignments so that training of the highest professional order can be maintained. We learned very early in the last conflict that war is a professional business and that amateurs who got on-the-job training during wartime can be very costly, not only in dollars, but in terms of lives. The Com-

(Continued on page 64)

*See note on preceding page.

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Prewar Incendiary Bomb Development

By L. WILSON GREENE

Scientific Director, Chemical Corps Technical Command, Army Chemical Center, Md.

The incendiary bomb played a highly important role in the defeat of the Axis powers in World War II, as will be attested by anyone who has seen the burned-out cities of Germany and Japan.

The Chemical Warfare Service was responsible for the development and procurement of all incendiary munitions produced in this country for use by our forces and our allies. Approximately 260,000,000 incendiary bombs of all types, requiring 250,000 tons of magnesium and 6,400 tons of Napalm, were produced for the Army Air Forces. In the high-explosive and incendiary attacks on German cities like Hamburg, Kassel, Darmstadt and Dresden, it was reported that between 75 and 80 percent of the total destruction caused by the attack was due to fire alone. It has been estimated that in Japan, fire bombs destroyed 160 square miles of the principal industrial cities. In Europe, only 6 percent of the total bomb tonnage dropped was made up of incendiaries, while in Japan the ratio was approximately 20 percent of the total. If the war had been prolonged, it was planned to drop on Japan a tonnage of incendiary bombs equal to that of high-explosive bombs.

During the years preceding the outbreak of World War II, the United States Army did not have a standard incendiary bomb. It was generally believed that there was no special requirement for an incendiary as such, and that high explosives in themselves had a satisfactory incendiary effect, in addition to their primary explosive action. Nevertheless, because the Chemical Warfare Service was charged with the research and development of incendiary materials, it persisted in the studies it had begun in World War I and established the series of projects which were to pay off so handsomely when World War II arrived.

The first peacetime project covering the development of incendiary filling for bombs was obtained by the Air Corps and the Chemical Warfare Service and approved for the fiscal year 1936. This project was the direct result of a Chemical Warfare Technical Committee meeting held on 27 April 1934 at which the Minority Report submitted by at which the Minority Report submitted by General (then Captain) George C. Kenny of the Air Corps recommended "That priority be given



FIGURE 1
Improvised Magnesium and Oil Bomb Burning on Test Platform.

to the development of an incendiary bomb which is capable of igniting materials that are fairly resistant to fire" and "is more satisfactory than either the existing WP bomb or any high-explosive bomb developed to date in this country."

Before discussing the experimental work conducted under the 1936 project, it might be well to review briefly the state of our knowledge concerning incendiary bombs at that time.

During World War I, a thorough investigation of about 40 incendiary materials was conducted at the American University. The most effective compositions resulting from this work were thermit and solid oils, and it was found that the peculiar properties of these two materials are best utilized when employed in combination. "Thermit is easy to ignite and produces an extraordinarily high temperature which, however, is largely wasted because of the rapidity of the heat development and its localization. Solid oils, on the other hand, produce a large mass of flame which burns for some time and can be

scattered over a considerable area." The foregoing quotation is taken from a report by Dr. A. L. Kibler, Chief, Information Division, Edgewood Arsenal, Maryland, which was prepared in April 1934.

Dr. Kibler also pointed out that WP is an excellent incendiary material, but this is not as effective as thermit and oils for setting fire to substances which are difficult to ignite. This is the result of its low ignition temperature and the fact that phosphorus produces a residue of fire-proofing material as it burns.

The following incendiary bombs had been standardized prior to initiation of the 1936 project:

INCENDIARY DROP BOMB, MARK I

The bomb was intended for use against grain fields, munition dumps, light construction, or similar targets where only a low degree of ignition is required. It was of the so-called "scatter type" because of the action of the exploding charge which expelled the incendiary material within a radius of 20 feet from the point of impact. The bomb body was identical with that of the 50-lb. HE bomb, standard at that time. The "Wet Bomb" filling consisted of balls of waste $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter immersed in one of the following incendiary oil mixtures:

- | | |
|----------------------|-----|
| 1. Carbon disulphide | 12% |
| Crude turpentine | 88% |
| 2. Carbon disulphide | 10% |
| Benzol | 10% |
| Crude kerosene | 80% |

The "Dry Bomb" filling consisted of incendiary units made of specially treated waste wrapped around celluloid spheres 2 inches in diameter. The spheres contained solid oil. The waste was saturated with molten aluminum nitrate, wrapped on the sphere and painted with a hot mixture of 10 parts TNT and 1 part naphthalene and sprinkled with 3 grams of black powder.

INCENDIARY DROP BOMB, MARK II MI

This munition was intended for use against buildings where penetrating effect followed by intensive incendiary action is sought. It weighed about 40 pounds. The body was a tapering zinc shell with a nose of drawn steel. The filling consisted essentially of a thermit charge and a solid oil charge. Additional incendiary effect was afforded by sodium nitrate contained in the nose below the thermit charge. Two sheet-lead cylinders filled with metallic sodium and embedded in the solid oil increased the difficulty of extinguishing the fire with water.

INCENDIARY DROP BOMB, MARK III

This bomb weighed about 100 pounds and was intended to be used against heavy permanent structures for the same purposes as the Mark II MI bomb. Except for minor modifications, the body was identical with that of the "Mark I High Capacity Drop Bomb" as specified by the Ordnance Department. The filling was practically the same as that used in the Mark II MI bomb.

8-OZ. INCENDIARY BOMB, MARK I

This was a slight modification of the British Baby Incendiary Bomb ($6\frac{1}{2}$ -oz. Incendiary Bombs Mk IV), which was considered the most effective incendiary bomb designed during World War I.

According to Fries and West (*Chemical Warfare*, McGraw Hill Book Co., 1921, page 343), "The British early recognized the value of a small bomb and consequently adopted their B.I.B. (Baby Incendiary Bomb). These are capable of being dropped in lots of 100 or more and thus literally shower a given territory with fire. The intensity of fire at any given point is much less than that obtained with the larger bombs, but the increased area under bombardment more than counterbalances this disadvantage. While the British aimed at the perfection of a universal bomb, the American service felt that two classes



FIGURE 2
Incendiary Bombs Resulting from World War I Research. From left to right: Mark II Bomb, Baby Incendiary Bomb; Mark I Dart, Mark II Dart, Mark I Dart (modified), Incendiary Grenade (for size comparison), Mark I Bomb.

should be developed, one to be used against grain fields and forests, the other against buildings." In another place (*loc. cit.*, page 340) Fries and West say, "These small bombs are carried in containers holding either 144 or 272 bombs. The former container approximates in size and weight one 50-pound H.E. bomb and the latter one 120-pound H.E. Bomb."

The body was made of tin plate with a lead-weighted base carrying the striker. A cartridge, or inner part of the bomb, consisted of a drawn aluminum tube fitted with a special 12-gauge shot gun cartridge head and cap. The filling consisted of Daisite (aluminum 17.5%, hammer scale 57.5%, and sulfur 25%, by weight) and a starter mixture (barium nitrate 60%, sulfur 20%, and aluminum 20%).

INCENDIARY DART, MARK I

This scatter-type bomb was intended for use against grain fields and other readily inflammable targets. The assembly contained 61 darts; each dart comprised an elongated 12-gauge shot gun shell filled with an incendiary material and provided with a firing mechanism to ignite the primer as the dart strikes the ground. The filling consisted of a booster and an incendiary charge. The composition of the booster was as follows: Reduced iron 38.4%, potassium nitrate 23.2%, and flowers of sulfur 38.4%. Either of the two following mixtures were optional as the incendiary charge for the dart: No. 1—Barium chlorate 54%, resin 15%, aluminum 14%, asphalt and varnish 16%; No. 2—Sodium chlorate 31%, iron filings 40%, powdered aluminum 10%, powdered magnesium 3%, boiled linseed oil or blown fish oil 16%.

INCENDIARY DART, MARK II

This dart is similar in design to the British Baby Incendiary Bomb and weighed about 6 pounds. It was designed for use against buildings or where penetrating effect and intensive incendiary action was desired. The body consisted of a zinc casing 2 inches in diameter and 15 inches long, provided with a cast-steel nose. The filling consisted of thermit and solid oil.

Some of these munitions are illustrated in Figure 2.

European Developments

A representative of the Chemical Warfare Service visited various European countries in the summer of 1936 to study developments in chemical warfare materiel. As a result of his visit and information obtained through Military In-

telligence sources, it was learned that the Germans had developed what was termed the "Elektron" incendiary bomb. This bomb weighed about 1 kilogram (2.2 pounds) and the body was made of magnesium. The bomb was pear-shaped and it is understood that the filling was made from a mixture of 60% high-speed thermit and 40% of finely ground Elektron metal (magnesium 94%, aluminum 6%, and a trace of copper). One thousand of these bombs were loaded into a hopper and dropped from an airplane in such

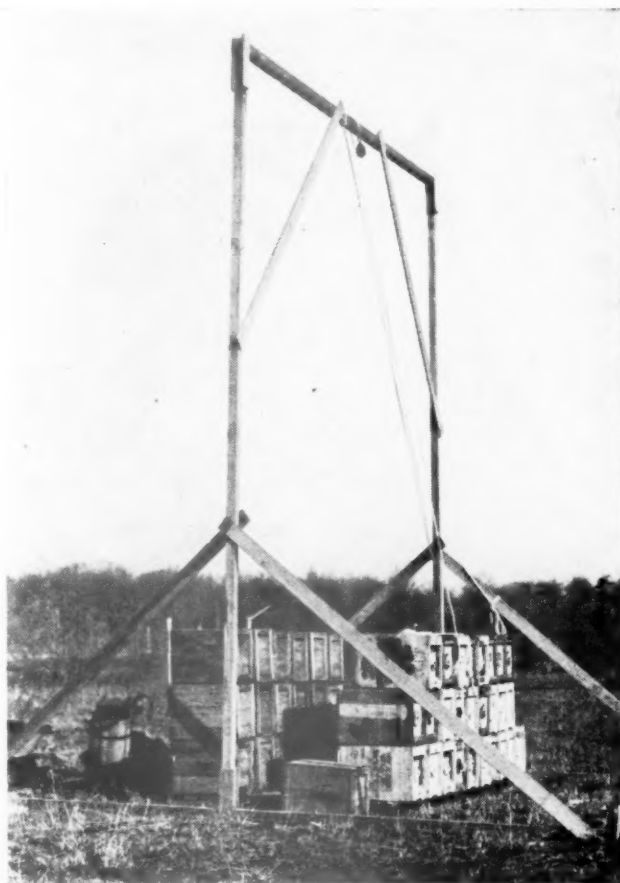


FIGURE 3
Test Structure for Experimental Incendiary Bombs

a way as to give a pattern of any desired number of hits per unit of target area. In Czechoslovakia, it was learned that these bombs were the best ever seen in that country. It was also stated that in Europe this type of bomb was considered the principal military threat against cities. A practice bomb of this type was advertised for sale in a bulletin issued by the Chemische Fabrik H. Stoltzenberg, of Hamburg, Germany, and a similar bomb was used by the Italians in the Ethiopian campaign.

In 1935, a reporter of the *New York Herald Tribune* was covering the Italian campaign in Ethiopia and found a partially burned incendiary bomb which had been dropped by an Italian

airplane. He shipped the bomb to the New York office of the newspaper which, in turn, gave it to Col. J. E. Zanetti, who was at that time a Chemical Warfare Reserve Officer and an authority on incendiary bombs. Colonel Zanetti forwarded the bomb, through the Ordnance Department, to General Brigham, who was then Chief, Chemical Warfare Service. The Italian bomb finally arrived at the Technical Division, Edgewood Arsenal, for examination. Chemical analysis of the bomb case showed that it was an alloy with the following composition: Magnesium 85.94%, aluminum 12.77%, copper 0.49%, insoluble matter (silica and insoluble carbides) 0.79%, with traces of calcium and iron. The bomb case was filled with a loosely bonded thermit made from hammer scale 76.4%, granular aluminum 15.1%, and aluminum bronze powder 8.5%. The way this information was used in our pioneering work in the development of the magnesium type incendiary bomb will be discussed later in this article.

Development Work

The first experimental work conducted by the writer under the incendiary bomb project in the fiscal year 1936 was concerned with an investigation of special thermit compositions as incendiary fillings for bombs. Dr. L. J. Lubowsky, in Brooklyn, N. Y., a thermit specialist, was called in as consultant. After several experiments with certain "boosters," or compounds employed to render the thermit reaction more violent, the following mixture was judged to be somewhat superior to commercial thermit: Ferric oxide 69.8%, aluminum 26.5%, calcium chromate (booster) 3.7%. The reaction appeared to be more violent, and it was believed desirable to use this composition in comparative tests with commercial thermit and other incendiary materials.

At a conference between representatives of Picatinny and Edgewood Arsenals, the Ordnance Department proposed that the mixtures used in airplane flares (pyrotechnic mixtures) be tested as incendiary bomb fillings. Two M8 airplane flares were obtained for test. One was compared with commercial thermit and was found not equal to thermit in heat intensity (burning through a steel plate), but the burning time of the flare was considerably longer. The other flare was placed on its side on a wooden platform 2 inches thick and ignited. The burning flare did not ignite the platform, but the flame charred the wood to a depth of about $\frac{1}{4}$ inch. The relatively long burning time of this composition and the hot flame produced by it led to

the decision that the pyrotechnic mixture should be included in further comparative tests. Accordingly, 50 "illuminants" containing a mixture of barium nitrate, aluminum, sulfur and binder were obtained from Picatinny Arsenal. This composition was pressed into cardboard containers at Picatinny, and the weight of each illuminant was 1 kilogram.

In view of the European interest in the Elektron type of incendiary, this material was included in the development. Based upon the chemical analysis of the Italian bomb examined at Edgewood Arsenal, the Dow Chemical Company of Midland, Mich., was asked if they could supply a magnesium alloy approximating the composition of Elektron metal. They recommended either the "Dow Metal F" or "Dow Metal I." Solid round stock of the former alloy, 4 inches in diameter, was purchased and experimental bomb bodies were made from it.

After several experiments, it was found that a cylindrical cup weighing about 650 grams and containing approximately 350 grams of modified commercial thermit would burn satisfactorily. The thermit was modified by increasing the ferroso-ferric oxide (Fe_3O_4) content by 15 percent to slow down the rate of reaction and produce a larger quantity of hot slag. The thermit ignited the simulated bomb case which burned for about 11 minutes, producing a very hot fire. Water thrown on the fire tended to spread the burning material rather than extinguish it.

In some of the preliminary experiments, the flame from an illuminant (pyrotechnic mixture) was projected onto a magnesium alloy bomb body. The incendiary effect appeared to be much greater than when either material was burned alone and a larger surface area was involved.

One other incendiary filling was chosen for the comparative tests. This comprised the thermit-solid oil combination used in the incendiary drop bombs Mark II MI and Mark III. Experimental bomb bodies consisted of sheet iron cylinders loaded with commercial thermit and solid oil (in separate compartments) so that the weight of incendiary filling did not exceed 1 kilogram.

A program for testing the following incendiary compositions was prepared on 10 January 1938:

- Commercial thermit
- Special thermit (Lubowsky formula)
- Pyrotechnic mixture (Ordnance Department formula)
- Magnesium alloy (Elektron metal) with modified thermit
- Thermit with solid oil.

The weight of incendiary filling used in this work was limited to 1 kilogram per experiment. This was done for two reasons. First, by using this relatively small quantity, it would be possible to economize on materials and test surfaces. The second reason was based on the reported European practice of carrying a large number of small incendiary bombs (weighing from 500 grams to 1 kilogram each) on one plane, instead of a very limited number of larger bombs.

Because the magnesium was so readily ignited by the flame from the pyrotechnic mixture, it was decided to add one other experimental bomb to the test program. This was designed in the form of a cup 4 inches in diameter with a wall thickness of $\frac{3}{8}$ inch and a base 1 inch thick. The cup was 3 inches high and was covered with a magnesium alloy plate $\frac{3}{16}$ inch thick. The alloy used was Dow Metal F. This purely experimental design was chosen for the following reasons: (1) 4-inch alloy rod was the largest diameter available commercially; (2) a cup was the most convenient shape to employ; and (3) a cup of the dimensions used would produce a test unit weighing approximately 1 kilogram when the pyrotechnic mixture was pressed into it. Fifty empty units were manufactured at Edgewood Arsenal and shipped to Picatinny Arsenal for loading with the pyrotechnic mixture.

In order to provide uniform test surfaces for studying the comparative incendiary effect of the various experimental fillings, wooden platforms 4 feet square were constructed of dressed pine boards 2 inches thick and 8 inches wide, nailed to 2-by-4-inch cross members. The platforms were supported on bricks about 2 feet above the ground level. Various roofing materials were attached to the platform surfaces to simulate residence and factory roof construction. Corrugated galvanized iron, tin, asbestos composition, asphalt-slate composition, slate, and tile were among the roofing materials used. Some of the wooden platforms were tested in dry and wet condition without covering, while others were coated with fire-resistant paint.

Upon the completion of these tests, it was concluded that the magnesium cup containing the pyrotechnic mixture was the most effective incendiary of all the types used in this investigation. Certain other materials, such as finely powdered zirconium and titanium metals, and their hydrides, were tried, but they were not nearly as effective as the magnesium-pyrotechnic combination.

The magnesium incendiary bomb is known as the intensive type; that is, it produces a hot fire concerned with an attempt to combine the inten-

in a restricted area immediately adjacent to the bomb. The oil incendiary bomb is called the scatter type incendiary since the contents of the bomb are projected over a much larger area. The next stage of the prewar development was

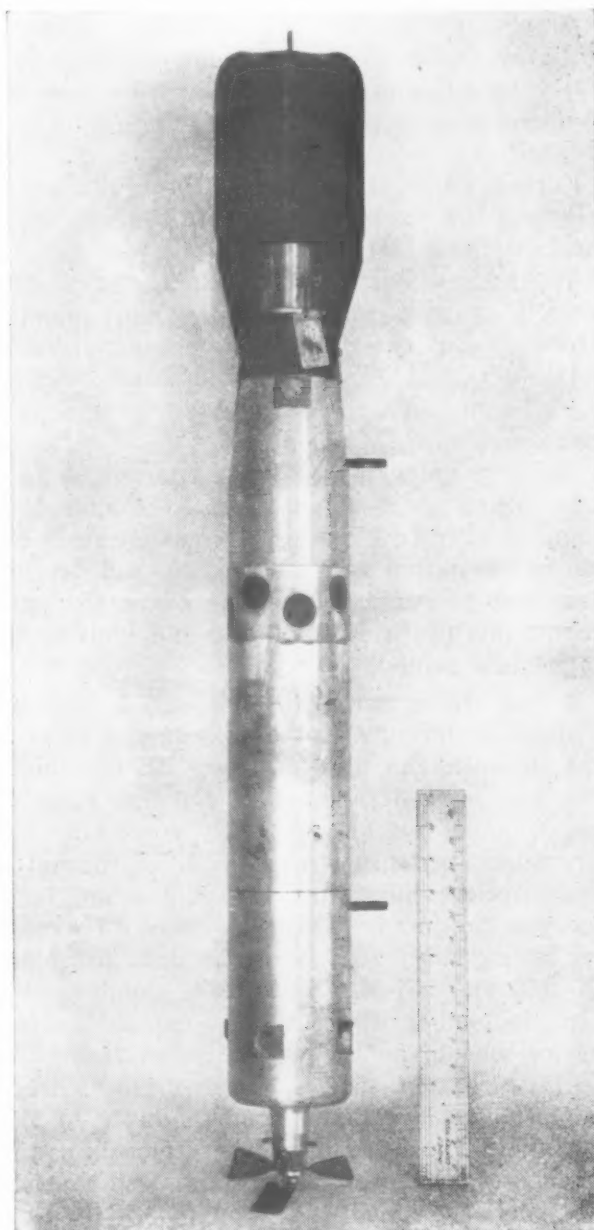


FIGURE 4
Combination Magnesium and Oil Bomb

sive and scatter effects into one single munition. To test this principle, a gallon can of kerosene was placed on top of one of the magnesium cups loaded with pyrotechnic mixture. The improvised bomb was fired, but the kerosene was consumed too rapidly to be of any value. The functioning of the bomb is shown in Figure 1.

The next step was the construction of a bomb from 4-inch magnesium rod. The nose and tail sections were loaded with the pyrotechnic mix-

ture, and the mid section was filled with kerosene. This mid section was designed so that the kerosene would be forced out through holes by a small charge of black powder which actuated a piston. The bomb was fuzed at both nose and tail. The bomb is illustrated in Figure 4. Figure 3 shows the test structure used for dropping the experimental bomb on an inflammable target, and Figure 5 illustrates the fire resulting about 1 min. after the bomb was dropped.

Further comparative tests on inflammable targets using the magnesium-oil bomb, the 30-lb. chemical bomb M1 containing thermit, and the 30-lb. chemical bomb M1 containing WP showed that the former was by far the most effective incendiary yet found.

The devastating fire raids on London during the blitz in 1940 demonstrated the enormous destructive effect of a large number of intensive incendiary units on city construction. As a consequence, further attempts to combine the magnesium and oil types of incendiary materials into one munition were abandoned, and development was concentrated on improving the pyrotechnic mixture used for filling and igniting the magnesium bomb.

It was stated earlier in this article that the pyrotechnic mixture employed was the same as that used in the airplane flare or illuminant. This had been designated as the M8 Flare by the Ordnance Department. By combining this pyrotechnic mixture with a modified thermit, a very effective filling for the magnesium bomb case was produced. This was called "Therm-8" and later "Thermate," and was used for filling AN-M50 and AN-M54 Incendiary Bombs.

In September 1941, the Chemical Warfare Service was given the entire responsibility for the investigation, design, development, storage, and issue of incendiary bombs. Prior to that date, the Service had only the responsibility for developing incendiary fillings and loading them into bombs designed and supplied by the Ordnance Department. The following incendiary bombs were developed and produced by the Chemical Warfare Service during the war:

- 4-lb. Magnesium Bomb (AN-M50A2).
- 4-lb. Explosive Magnesium Bomb (AN-50XA3).
- 2-lb. Magnesium Bomb (AN-M52A1).
- 4-lb. Thermate Bomb (AN-M54).
- 6-lb. Solid Oil Bomb (M69).
- 6-lb. Explosive Solid Oil Bomb (M69X).
- 6-lb. PT Gel (Goop) Bomb (M74).
- 6-lb. Explosive PT Gel (Goop) Bomb (M74X).

100-lb. Solid Oil Bomb (AN-M47A2).

500-lb. PT Gel (Goop) Bomb (AN-M76).

It will be seen from the foregoing that the Chemical Corps (then Chemical Warfare Service) was actively engaged in the development of in-

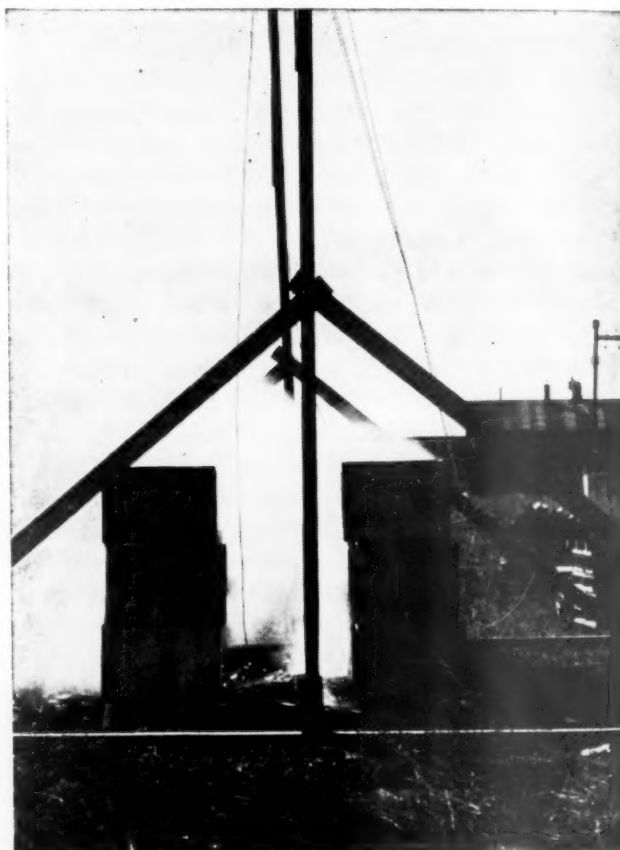


FIGURE 5
Fire Resulting One Minute after Combination Bomb was Fired

cendiaries during the years preceding World War II, and was well prepared to carry out the extensive development and supply program which was assigned to it in the fall of 1941.

The
Chemical Corps
Association
Is A Part of the
National Chemical
Defense

Paint Spray Respirators E1R3 and E3R1

When investigation revealed that commercial paint-spray respirators failed to give adequate protection against harmful vapors, mists, and aerosols incident to paint spraying, or were uncomfortable to wear, the Chemical Corps, at the request of the Army Ordnance Department, undertook development of suitable respirators. A self-contained canister-type respirator and a hood-type supplied-air respirator were developed.

For adequate protection against paint spray, both an aerosol filter and a vapors adsorbent is required. In most commercial respirators, vapors adsorption only is provided. Those respirators which do include both a filter and an adsorbent do not give sufficient protection against paint-spray aerosols. The standard Army gas masks provide adequate protection against vapors and aerosols, but they are not as comfortable to wear as some of the commercial paint-spray respirators.

The Chemical Corps has developed two general types of paint-spray respirators which will be recommended for standardization early in fiscal year 1948. One is a canister-type half-mask respirator provided with replaceable adsorbent cartridges and aerosol filters. The other is a hood-type supplied-air respirator which uses air from the spray gun supply line.



PAINT-SPRAY RESPIRATOR E3R1

The canister-type respirator has been designated the E1R3. It consists of a Mine Safety Appliance Co. "Comfo" half mask with one Chemical Corps canister E53R1 attached to each side of the half mask. Canister E53R1 consists of a threaded receptacle, an adsorbent cartridge containing charcoal, a replaceable aerosol filter disc of type 5 filter material, and a threaded cover.

The hood-type supplied-air respirator has been designated E3R1. It is constructed of a butyl-coated nylon headpiece with a full-vision plastic window shaped so as to reduce interference with spectacles. A disposable, thin plastic window shield is placed over the plastic window to protect it against contamination by paint spray. The headpiece is connected to the paint-spray air-supply line through a flexible hose and a regulating valve near the spray gun. A canister is inserted into the supplied-air line between the compressor and headpiece to remove odors. Conclusions drawn from engineering tests are that the canister-type respirator is suitable for general use and that the hood-type supplied-air respirator is preferable for working in confined spaces.

Paint-spray respirators E1R3 and E3R1 were developed by William E. Gross, Randolph Monro, and Henry Ellner, Protective Division, Chemical Corps Technical Command, Army Chemical Center, Maryland.



PAINT-SPRAY RESPIRATOR E1R3

Mine Safety Appliance Co. "Comfo" half mask with improved canisters E53R1. Replaceable filters are used in the canisters.

Status of the U.S. Army Service Gas Masks

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I. INTRODUCTION

Toxic, irritant or vesicant materials were not employed offensively during the recent war except on some few occasions by the Japanese against the Chinese. Nevertheless, each of the major powers was prepared to retaliate if an enemy had adopted a general policy of employing gas warfare. For this contingency each nation kept reserves of various kinds of equipment to protect against chemical warfare agents, among which the gas masks were preponderant in numbers. Millions of gas masks were used for training, or were carried by soldiers in some theaters whenever uncertainty prevailed regarding enemy intentions on the use of gas warfare. Besides the military gas masks, there were others for civilian populations in sizes for fitting preschool age children to sizes for large adults; there were infant protectors for children of prewalking age and walking age but too immature to wear gas masks; there were gas masks for horses, mules and dogs; pigeon protectors; and collective protectors for ventilating dugouts, rooms or buildings with air purified by removal of chemical agents. Protective clothing to exclude vesicants was made in both porous and nonporous types—that is, permeable to air and impermeable to air. Protective ointments were provided for men, and protective covers for men, materiel and foodstuffs (10). The gas mask provided individual respiratory protection and held its predominant position among the numerous kinds of protective equipment because of the rapid incapacitating effects of airborne military agents if inhaled by persons lacking the protection.

The principles governing the operation and performance of gas masks and respirators are old (1) (13); but little use of them was made until gas warfare occurred during World War I. Since that time steady improvement has been evident. The gas masks employed in World War I (5) protected against the agents employed at the time; but they were deficient in protection against some gases according to current standards for U. S. Army gas masks. The protection against these gases has been augmented until it is of the same order as that provided against the older gases; nevertheless greatest protection, that is grams of gas absorbed per canister prior to gas penetration, is still afforded against the main gaseous agents of World War I, phosgene, chlorpicrin and mustard. Statements have appeared in the news that gases of military value have been developed against which the modern military gas mask does not protect. These statements are unfounded.

Protection against particulates including aerosole of diphenylchlorarsine or clouds of chloracetophenone has been raised even more than the protection against the early military gases and vapors by means of improved filter materials. Like the canisters of the later period of World War I, the modern military canisters employ fibrous filters for restraining particulate matter, and granular absorbents for the gases and vapors. Similar materials are used in some canisters manufactured commercially for industrial purposes; but the materials

meeting commercial requirements may not meet the requirements for military service in many respects, nor is it necessary that they do so.

Considerable information was published on the performance of gas masks for industrial use in the period between the world wars. In this country, the U. S. Bureau of Mines contributed largely to the published information. Much information on the specification requirements and test performance of military gas masks and their active components has been in restricted classification in the United States as well as in other countries, and much still remains so. However, a general review of the status as given hereunder can be presented. The statements refer to the U. S. Army service types of gas masks, rather than to special gas masks with more limited usages such as the diaphragm gas masks or telephone gas masks for transmitting the voice, optical gas masks for use with optical instruments such as binoculars or range finders, headwound gas masks for use by the Medical Corps on casualties requiring such masks, or the simpler training gas masks. The special gas masks, excepting the training gas masks, are provided with canisters identical with those on service types of gas masks and therefore give similar protection. The training gas masks have smaller canisters containing less gas absorbent than the various types of service canisters; they were simpler in construction and less expensive; they give full protection in training use; but the gas protection lasts a shorter period than that of the service canisters. Hence the training gas masks were standardized only for training purposes in the interests of economy.

This paper stresses the improvements in construction and manufacturing technique to reduce the labor and costs required for manufacturing the modern U. S. Army service gas masks; the assemblies and the major components are explained; some data on the physical and chemical properties of the canisters are presented; and some recent important theory related to the action of canisters is stated.

II. GAS MASK ASSEMBLIES

As some understanding of official gas mask nomenclature will help to interpret the designations that follow, a brief explanation is given. Gas masks comprise three major components, the facepiece, the canister and the carrier. The head harness, and the hose if present, are parts of the facepiece. Gas mask nomenclature includes a descriptive name followed by three symbols separated by two dashes, representing the three main components in the order stated above, for instance, Service Gas Mask MIA2-IXA1-IVA1. M stands for "model" of an item which is formally standardized to permit procurement and issuing, I is a Roman numeral, and A stands for "alteration." The letters E and R stand for "experiment" and "revision" in symbols assigned to nonstandard experimental models. The letter M used with the symbol for a standard facepiece is not repeated in the symbol for a standard canister or a standard carrier following the facepiece symbol unless an "E and R number" intervenes between two "M and A numbers."

Five types of service gas masks, available for U. S. Army use during all or part of World War II, are shown in Figures 1, 2, 3, 5 and 6. A sixth type, not developed

to the production stage during the war, is shown in Figure 7. The trend in the series of masks was toward lighter weight and smaller bulk. The weights in the order of the respective figures, without added accessories such as protective covers, protective ointment and eye-shields are 5, 5, 3½, 3, 2½ and 3 pounds. Some of the salient features of the assemblies are outlined below, followed by more complete descriptions of the components.

A. Service Gas Mask MIA2-IXA1-IVA1

This gas mask, shown in Figure 1, was built with a stockinette covered rubber facepiece and a 27-in. stockinette covered rubber hose connecting to a canister held in a carrier of waterproof duck supported under the wearer's left arm. The carrier and canister remain in this position when the facepiece is removed from the carrier and donned.

The Service Gas Mask MI-IXA1-IVA1 was manufactured prior to the war and stocks were available for use together with later types of wartime manufacture.

B. Service Gas Mask M2A2-9A2-IVA1

The same carrier MIVA1 was used with this gas mask (Figure 2), and the preceding gas mask; improvements lay in the facepiece and canister. The facepiece is fully molded to the shape of a face; it has no stockinette covering, nor has the hose. Stockinette coverings were omitted also from all subsequent gas mask facepieces and hoses; this was permissible because of the improved age-resistance developed in rubber and synthetic rubber stocks. Other features are described in detail hereafter.

C. Lightweight Service Gas Mask M3-10A1-6

The lightweight service gas mask (Figure 3) is also carried under the wearer's left arm in the carry position; but is moved to the chest for the alert position and for use. An 18-in. hose leads purified air from the canister, which remains in the carrier, to the facepiece for breathing. The lightweight service gas mask includes a nose cup (Figure 4) inside of the facepiece to fit over

the wearer's nose and mouth. Air for inhalation enters The nosecup reduces the tendency of the lenses to become each side of the nose position; exhaled air leaves the nosecup through the outlet valve at the position of the wearer's mouth as seen on the outside of the facepiece. The nosecup reduces the tendency of the lens to become fogged by moisture condensing from exhaled air. Nose-cups were not developed for the other types of service gas masks available during the war.

D. Combat Service Gas Mask M5-11-7

The drum-shaped canister M11 employed on this gas mask has a threaded nozzle to screw into a mounting piece on the left cheek of the facepiece as pictured in Figure 5. The mounting piece includes a rubber-disk type of inlet valve to check back-flow of air; inlet valves were located at the air-inlet of the canisters of the other masks described above. Smaller numbers of combat service gas masks were made with the canisters mounted on the right cheek of the facepieces for the use of left-handed riflemen. Hose tubes are eliminated by means of these assemblies. The head harness includes the six elastic-webbing straps used on the masks made with hose tubes and an additional strap extending from the two cheek positions around the back of the neck; the additional strap prevents displacement of the facepiece and contingent leakage at the facial seal when the canister sways in violent action.

E. Snout-Type Combat Service Gas Mask M8-11-10

This gas mask (Figure 6) combines the fully molded facepiece of the service gas mask with the canister of the combat mask. The canister nozzle screws into an adapter affixed to the air-inlet stem at the chin position of the facepiece. An inlet valve of rubber-disk type is located in the adapter. The head harness includes the strap around the back of the wearer's neck like that on the combat service gas mask. The facepiece-canister assembly is less compact than that of the combat service



FIGURE 1
Service Gas Mask MIA2-IXA1-IVA1 with a facepiece fabricated of a model flat faceblank with a stockinette fabric covering.



FIGURE 2
Service Gas Mask M2A2-9A2-IVA1 with a faceblank molded without stockinette covering to the shape of a face and a hose without stockinette cover.



FIGURE 3
Lightweight Service Gas Mask M3-10A1-6. The faceplate includes a nose cup shown in Fig. 4.

mask; but the fully molded faceblanks, or rubber foundation on which the facepiece is built by assembly of eyepieces, headharness parts, outlet valve and canister adapter, were vulcanized in the same molds in which the fully molded faceblanks for service gas masks were manufactured. These molds were simpler than those for the combat service facepieces and were available in greater numbers. Molds for faceblanks with limited dimensional tolerances over numerous warped surfaces are difficult to produce and require the highest skill of the mold makers (12). Combining the faceblank of the lightweight service gas mask with the combat canister therefore enabled greater production of a fairly compact gas mask when especially needed.

F. Combat Service Gas Mask E19R46-M11-7

This experimental gas mask (Figure 7) represents a phase of the present development to improve the combat gas mask. The improvements lay in eliminating a patch from the facepiece and the modifications simplify the production as mentioned hereafter. The canister and carrier are identical with those of the standard combat service gas mask M5-11-7.

The integral U-shaped deflector tubes for directing influent air over the eyepieces are molded to pass just under the nose portion of the faceblank. The name of "mustache-type" facepiece has been given to the E19R46 because of its appearance.

III. FACEPIECES

The appearance of the various service facepieces is shown with the gas mask assemblies in the illustrations and some description has already been given. Additional explanation of the facepieces to show the successive improvements in structure and methods of assembly follows. The service facepieces are now molded in three sizes to fit the various faces of army personnel; size designations are small, universal and large. Over 90 percent of the faces can be fitted with the universal size, and more of the small size than of the large are needed for persons not fitted by the universal size (12).

A. Service Facepiece M1A2

The service facepiece M1A2 (Figure 1) was built from a flat trapezoidal faceblank molded in uniform thickness. One surface of the faceblank forming the outer surface of the facepiece assembly was covered with stockinette fabric adhered in the molding process. Cloth patches adhered in molding were located on the opposite side at positions to back the stitching for attaching the buckle tabs for the headharness. Faceblanks shaped for assembling into facepieces, including holes for eyepieces, were died from the trapezoidal faceblanks. Headharness buckle-tabs were stitched to the faceblank and the stitching was covered on the inside with rubber cement, then with adhesive plaster, to stop leakage. Eyepieces consisted of flat circular safety-glass lenses affixed to the faceblank with sets of three metal rings per lens. One ring served as a grommet to attach a threaded ring. The third ring, also threaded, was screwed onto the assembly to bind the lens against a rubber gasket resting on the grommet. Two edges of the faceblank were then stitched together to form a "chin-seam" with butted edges; the seam was coated with rubber cement and covered with bias adhesive tape. A metal angletube assembly was bound with wire loops into the aperture left at the mouth position of the faceblank and the loops were covered with adhesive tape. The angletube assembly comprised the metal angletube itself, a rubber outlet valve, metal outlet valve guard and a rubber deflector for discharging incoming air over the inner surfaces of the lenses for the purpose of reducing fogging. Each deflector was cemented to the inside of a facepiece at two opposite cheek-positions. Finally the headharness assembly and the 27-in. stockinette-covered hose were attached. The hose was bound with wire loops onto a stem of the angletube and the wire was then covered.

The operations mentioned for assembling a service facepiece M1A2 indicate the variety and amount of work required. The variety of operations was considerably reduced and the amount of handiwork required was mostly eliminated when the fully molded facepiece was



FIGURE 5
Combat Service Gas Mask M5-11-7 from which the hose is eliminated.



FIGURE 6
Snout-Type Combat Service Gas Mask M8-11-10, having a canister mounted at the chin position.



FIGURE 7
Combat Service Gas Mask E19R46-M11-7 with a "mustache-type" facepiece. The deflector tube passes under the nose position.

covered with felt to restrain dust from the absorbents, developed and standardized to permit its manufacture. A considerable saving in the cost of facepieces resulted.

B. Service Facepiece M2A2

This facepiece (Figure 2) is assembled on a fully molded faceblank (2) (6) (11) vulcanized in a shape to fit the faces of wearers. The fully molded faceblank includes integral deflector tubes to lead purified air from a hose-stem at the chin position to the eyepiece lenses. Pads made by increasing the rubber thickness were molded at six outside positions for anchoring the headharness buckle tabs.

The assembly of this facepiece was relatively simple, rapid and less costly than the assembly of the service facepiece M1A2 from flat faceblanks. The six headharness buckle-tabs were machine-riveted to the faceblank. Large triangular, cylindrically curved lenses with rounded corners, molded of clear cellulose acetate, were inserted in sockets in the faceblank and metal eyerings with lugs at the back were machine-cripped around each lens assembly. An outlet valve assembly was inserted into the stem at the mouth position and then bound with wire loops as stated in the next paragraph. A 27-in. hose of bare rubber with an internal metal ferrule in the end was inserted into the hose-stem of the faceblank and the junction was wired similar to the outlet valve stem. Finally the six strands of the headharness assembly were buckled on to complete the facepiece.

Bindings at the outlet valve stem and hose stem were made by wrapping a strip of adhesive tape around the part, and by binding a double loop of wire on the tape by twisting the ends with an automatic hand tool. Often a clamp of wire applied with special hand tools was used instead of the loops. Each wire loop or clamp was covered with a strip of adhesive tape. All wire bindings on other fully molded facepiece assemblies mentioned hereafter were applied similarly.

Fully molded facepieces like the M2A2 have been made commercially in the United States for industrial gas masks and for military use by some foreign governments.

C. Service Facepiece M3

The service facepiece M3 differed from the M2A2 in the addition of a nosecup, described below, in the use of an 18-in. hose instead of 27-in., and in the arrangement

of the headharness attachments at the cheek positions. No changes were made in the attachments at the temple and forehead positions.

The pads at the cheek positions of the M2A2 had extensions sloping toward the chin, as seen in Figure 2. The sloping members or "rifle skids" were intended to prevent interference between a buckle-tab assembly and the stock of a rifle while sighting. In the service facepiece M3 the pads at the cheeks and the rifle skids were eliminated; instead, pads were molded onto lugs extending beyond the edge of the faceblank at the cheek positions. The change provided smooth contact surfaces between a facepiece and a rifle stock.

1. Nosecup

The nosecup is a small internal mask covering the nose and mouth of a person wearing a gas mask. Contact with the face is made at flanged edges extending from the chin around the cheeks near the mouth and nose and over the bridge of the nose. An inlet valve of the disk-type is mounted in a port at each side of the nose to permit inflow of air for inhalation and to check backflow. The nosecup prevents humid exhaled air from contacting and fogging the lenses in a range of low temperatures wherein the action of the air delivered through the deflector tubes alone may not be fully effective.

The nosecup was assembled by inserting its hollow stem into the outlet valve stem of a faceblank, turning the excess length back and over the faceblank stem, inserting the outlet valve assembly into the aperture, binding with wire and taping. Two integral lugs on the sides of the nosecup, and a chin-portion, were then vulcanized or cemented to the faceblank.

Only the service facepieces M3 of those described, herein, have been equipped with nosecups. Nosecups under development will be applied to other types of facepieces in subsequent manufacture.

D. Combat Service Facepiece M5

The faceblanks for this facepiece (Figure 5) are vulcanized in molds similar to those for the service facepiece M3; but modified to eliminate the hose stem from the chin and to provide a stem for attaching canisters at the left, or right, cheek position. The cores to form the deflector tubes are anchored in the mold at the eyepiece



FIGURE 4
Interior of a service facepiece M3 showing a nosecup which excludes humid exhaled air from contacting the lenses.

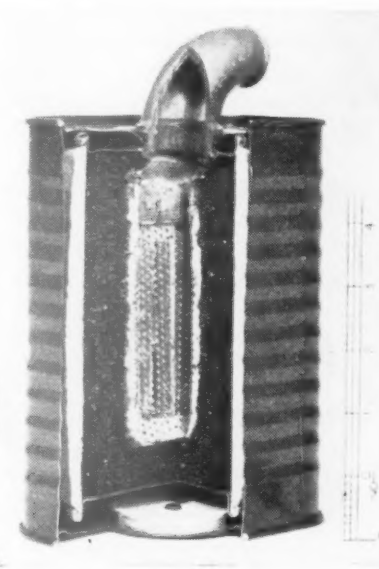


FIGURE 8
Sectionalized view of the Service Canister MIXAL

and at the chin positions. Removal of the cores leaves an aperture in the chin, which is sealed with a patch vulcanized in a subsequent operation. Assembly operations for this facepiece are the same as those for the service facepiece M3 except for the omission of the hose and nosecup and the addition of a threaded metal "mounting piece," bound in the canister stem of the faceblank with wire. The mounting piece assembly includes a disk-type inlet valve to check back-flow of exhaled air and a gasket against which the end of the threaded canister-nozzle makes a gastight seal when screwed into the mounting piece.

The head-harness includes six straps of elastic webbing joined in a pad at the back of the wearer's head, and in addition it has an elastic strap to lay around the back of the wearer's neck as previously mentioned.

E. Snout-Type Combat Service Facepiece M8

This facepiece (Figure 6) combines most of the faceblank and assembly of the service facepiece M3 with the head harness of the combat service facepiece M5 having the strap at the back of the neck; it omits the nosecup and the hose. A metal adapter for attaching a combat canister M11 replaces the hose at the chin position.

The snout-type facepiece is symmetrical with respect to the vertical centerplane and requires only one type of mold for each of the three sizes, whereas the unsymmetrical facepiece of the combat service facepiece M5 are made for left-cheek or right-cheek canister mounting and require two types of molds in each of three sizes. However, the symmetrical construction has the disadvantage of producing a gas mask with somewhat greater bulk than the unsymmetrical form.

F. Combat Service Facepiece E19R46

This facepiece is in the service test stage of development. It improves upon the standard combat service facepiece M5 in the construction of the faceblank. The patch that is present in the M5 facepiece is eliminated from the chin of the E19R46 thus avoiding one vulcanizing operation. This is done by employing a short integral U-shaped core for the deflector tubes which unite under the nose position. The short core can be extracted after the vulcanization through a port of a deflector tube at an eye position. Dimensions of the E19R46 facepiece have been modified from those of prior models to improve its face-fitting qualities (12).

A process for molding faceblanks E19R46 by an injection process is being developed through a research contract with a rubber manufacturer. The process when

successful will reduce the labor required in conventional vulcanizing methods using hand loaded molds, shorten the time cycle for vulcanizing faceblanks and reduce the number of molds and presses needed to obtain production.

IV. CANISTERS

The service canisters, issued during the period of World War II, were developed in progressively smaller sizes and lighter weights. Improvements in the impregnated charcoal filling for restraining gaseous chemical agents, as indicated by Emmett (7) and in the paper filter materials for restraining aerosols, permitted some of the decrease. The changes were welcomed, according to service tests, by the soldiers already heavily burdened with accoutrement.

Complete gas protection was provided by all the canisters but some reduction in gas absorbing capacity and hence in the duration of the useful life was incurred with reduction in size. The lesser life was counterbalanced to some extent by providing threaded nozzles on the smallest canisters, combat M11, to permit quick removals and replacements on gas masks. Resistance to breathing increased with size reduction but was kept below the tolerable upper limit of 75 mm H₂O measured with 85 L./min. air flow. The efficacy for restraining aerosols was retained while reducing the size, and it lasts throughout the useful life of the modern U.S. Army canisters. The life depends generally upon the amount of gas adsorbed, or on physical damage in the rough service encountered; water vapor taken up by the impregnated charcoal has an adverse effect on the capacity for restraining some chemical agents including many organic vapors, of which chloropicrin is typical, but the water may improve the capacity, particularly in the larger canisters, for agents such as phosgene.

The construction and some chemical and physical features of the canisters are described below.

A. Service Canister MIXA1

A sectionalized model of the MIXA1 service canister, mostly manufactured prior to the war, is pictured in Figure 8. Unpurified air enters through an inlet valve at the bottom and surrounds the air purifier which is rigidly spaced from the outer body at the bottom and around the sides. The air filters radially to remove smokes or other aerosols, through ten layers of carbon-black-impregnated paper filter material wrapped on the chemical container of which the sides are perforated sheet metal; it then filters through a mixture of toxic-gas absorbents composed of granular impregnated charcoal and soda lime mixture, 80:20 by volume. The purified air enters a central inner tube of perforated metal.

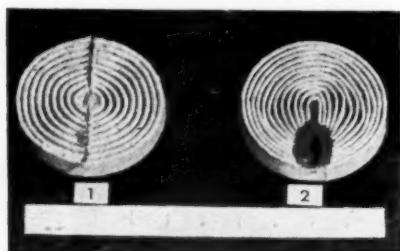


FIGURE 11
Pleated filters used in combat service canisters:

1. Concentrically pleated filter.
2. Shell pleated filter.

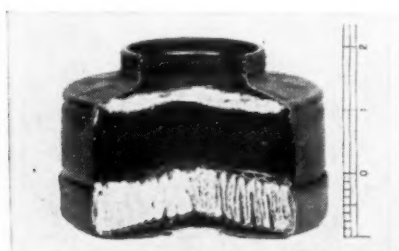


FIGURE 10
Sectionalized Combat Service Canister M11.

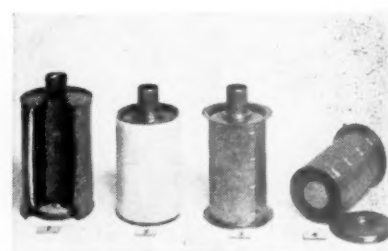


FIGURE 9
Lightweight Service Canister M10A1 and subassemblies:

1. Sectionalized canister.
2. Air purifier comprising a chemical container wrapped with filter material.
3. Chemical container.
4. Empty chemical container.

leaves the canister through a nozzle to which a hose is attached and passes to the facepiece for breathing.

Some characteristic physical and chemical data for the MIXA1 canister and those described below are compiled in Tables 1 and 2.

B. Service Canister M9A2

The structure and metal parts of the M9A2 canister were essentially the same as those of the MIXA1, shown in Figure 8; improvements were in the filtering elements. Seven layers of a paper filter material containing asbestos

fiber effectively restrained particulates and the granular absorbent body for toxic gases was composed of impregnated charcoal without admixed soda lime.

C. Service Canister M10A1

The assembly of this canister in several stages is shown in Figure 9. The body is cylindrical; the size and weight were reduced considerably from the prior designs. Seven wraps of asbestos-type filter material comprised the aerosol filter and the granular absorbent is all impregnated charcoal.

TABLE 1.—Physical Characteristics of U. S. Army Gas Mask Canisters in Service During World War II.

Canister Type	Weight (Approx.)	Dimensions of Outer Body (Less Nozzle)	Absorbent		Filter Material		Canister Resistance to Air Flow (Maximum) (a)
			Type	Volume (Minimum)	Type	Layers in Filter	
MIXA1	grams 1000	in. 3 x 4 $\frac{5}{8}$ x 6 $\frac{1}{2}$	Impregnated charcoal & soda lime mixture, 80-20 by volume	ml. 640	Carbon black impregnated paper	10	mm. H ₂ O 55
M9A2	1000	"	Impregnated charcoal	640	Paper containing asbestos fiber (b)	7	58
M10A1	600	3.3D. x 5 $\frac{3}{8}$	"	330	"	7	75
M11	Aluminum 250 Steel, 350	4 $\frac{1}{4}$ D. x 2 $\frac{1}{2}$	"	245	"	1	75

NOTE: (a) Resistance was measured with a water manometer while air flowed at the rate of 85 L./min. through a canister.

(b) Most paper was made with a gauze fabric backing, some was without the backing.

TABLE 2.—Typical Chemical Characteristics of U. S. Army Gas Mask Canisters.

Type of Canister	Test Conditions							Life (d)	Gas Absorbed
	Chemical Agent		Air Flow		Relative Humidity				
	Gas (a)	Concentration in Air	Rate	Type (b)	Canister (c)	Air at Room Temperature			
		mg./L.	ppm	L./min.		%	%	min.	g.
MIXA1	PS	50.3	7500	32	C	AR (e)	50	55 (g)	89
"	PS	10	1487	50	I	AR	50	80	40
"	PS	10	1487	50	I	80	80	20	10
"	CG	20.25	5000	32	C	AR (e)	50	55 (g)	36
"	CG	10	2470	50	I	80	50	70	35
M9A2	PS	50.3	7500	32	C	AR (f)	50	55 (g)	89
"	PS	10	1487	50	I	AR	50	120	60
"	PS	10	1487	50	I	80	80	35	17
"	CG	20.25	5000	32	C	AR (f)	50	55 (g)	36
"	CG	10	2470	50	I	80	50	100	50
M10A1	PS	50.3	7500	32	C	AR	50	30	48
"	PS	10	1487	50	I	80	80	20	10
"	CG	20.25	5000	32	C	AR	50	40	26
"	CG	20	4940	50	I	80	50	22	22
M11	PS	50.3	5000	32	C	AR	50	24	39
"	PS	10	1487	50	I	80	80	16	8
"	CG	20.25	5000	32	C	AR	50	36	23
"	CG	10	2470	50	I	AR	50	43	22
"	CG	10	2470	50	I	80	50	41	21

NOTES: (a) PS=symbol for chlorpicrin; CG=symbol for phosgene.

(b) C indicates continuous uniform flow; I indicates intermittent sinusoidal flow simulating breathing.

(c) The figures give the relative humidity of the air at 25° C., with which a canister was equilibrated prior to testing it against gas.

(d) Life is determined by the duration of a gas test until a color change occurs in a chemical indicator showing that a physiologically significant concentration of the gas has penetrated the canister.

(e) AR indicates "as received"; the maximum moisture content in the absorbent is 6%.

(f) The maximum moisture content in the absorbent is 5%.

(g) The 55 minute lives are representative of large numbers of test results which vary largely. For example, 25 canisters MIXA1 tested consecutively against PS to determine the acceptability of a newly manufactured lot, gave an average life of 55 minutes with 42 minimum and 73 maximum. The standard deviation in the lives of this group was 7 minutes. The minimum acceptable life stipulated by official specification was 33 minutes.

D. Combat Service Canister M11

Figure 10 shows a sectionalized view of the M11 canister. The size and weight were again made less than those of prior canisters. The air flows axially through the purifying elements instead of radially as in earlier types. Axial flow has been employed in many foreign military canisters, notably the German ones, and was used in U.S. Army canisters of World War I, after which it was discontinued until the M11 was standardized.

Absence of a central tube contributes to the reduction in size and weight sufficiently to permit the M11 to be attached directly to a facepiece at the cheek position as on the combat service facepieces M5 or E19R46, or at the chin of the snout-type combat facepiece M8, without undue fatigue of a wearer's neck muscles. Use of aluminum instead of steel in the M11 canister reduced the weight from 350 to 250 grams.

Air enters the bottom of the canister through an orifice which includes no inlet valve; but inlet valves are included in mounting pieces or adapters forming a part of the facepieces that receive the threaded nozzles of the canisters. The air passes first through a circularly pleated filter or a shell pleated filter (Figure 11), constructed to provide a large filtering area within a small volume of the canister. It then passes through the granular impregnated charcoal held rigidly between structures of metal screen and perforated metal fixed in position by beading the canister body. The upper screen structure includes a fibrous filter to arrest dust from the charcoal.

A disadvantage of the combat canisters is lesser resistance to the effects of deformation due to rough treatment. Deformation of the upper part containing the absorbent layer contributes to lesser gas life, and the lighter-weight aluminum-body canisters are more vulnerable than those of steel. The canisters having radial flow through the air purifying elements are much more resistant to the effects of rough handling and deformation on the gas life.

The combat canister M11 and a similar British combat canister are interchangeable on combat type gas masks made in England and in the United States. Apart from interchangeability there are numerous differences in other features of the canisters and facepieces of the respective

masks. The concentrically pleated filter in the M11 canister is similar to those used in German military canisters; the shell pleated filter is an American design.

E. Physical and Chemical Characteristics

The physical and chemical characteristics of the canisters are listed in Tables 1 and 2. Measurements are given partly in the metric system and partly in the British system according to custom.

The last column of Table 2 shows large differences in the amounts of gases absorbed prior to penetrations through the various types of canisters, ranging from 8 grams of PS for the smallest canisters, M11, tested under the most adverse conditions, to 89 grams of PS for the largest canisters, MIXA1 or M9A2, tested under less severe conditions but highly rigorous compared to those likely to be encountered in actual service. Laboratory conditions are arranged to permit rapid completion of tests. Field conditions under gas warfare are deadly but generally mild compared to the conditions established for laboratory testing. In the field the most severe conditions are transient at each locality because of winds, convection or gaseous diffusion, although the conditions may persist more in wooded depressions than elsewhere.

Penetration of gases through canisters increases slowly so that time remains for exchanging to a fresh mask or canister prior to dangerous penetrations.

Although the M9A2 canisters contained impregnated charcoal alone, while the MIXA1 canisters of equal size contained 80 volume-percent of impregnated charcoal and 20 percent soda lime which is inert to PS, the PS lives were about equal on the 32 L./min. continuous flow test. This is because the superior charcoal accepted at the time was used in the smaller M10A1 canisters while the remaining charcoal with lesser gas capacity was used in the M9A2 canisters. Tested on the "breather" apparatus with gas and air flowing at the overall rate of 50 L./min. the M9A2 canisters show greater PS lives than the MIXA1. The elimination of soda lime and its replacement with the modern impregnated charcoal to produce the M9A2 canister resulted in PS protection equal or superior to that given by the MIXA1 canisters containing the soda lime-charcoal mixture. The advantages extended also to the protection against CG.

TABLE 3.—Characteristics of Filters in Service

Type of Filter	Type of Canister Containing Filter	Sheet Thickness		Tensile Strength (Minimum) (a)	Sheet Resistance to Air Flow (Maximum) (b)	Plies of Material Per Filter Assembly
		Minimum	Maximum			
Carbon black impregnated paper	MIXA1	in. 0.019	in. 0.030	lb./in. 1.7	mm.H ₂ O 11	10
Paper containing asbestos fiber	M9A2	0.019	0.030	1.7 (d)	14 (e)	7
"	M10A1	0.019	0.030	1.7 (d)	14 (e)	7
Dense paper containing asbestos fiber	M11	0.035	0.045	2.3	110	1 (f)

NOTES: (a) Measured on the longitudinal or machine direction of the paper.
(b) Resistances were measured with air flowing at the rate of 85 L./min. through a single sheet of filter material 100 sq. cm. in area, or through an assembled filter.
(c) DM = diphenylaminechlorarsine.
(d) This requirement was exceeded greatly by gauze-backed filter material.
(e) The specification requires the resistance test to be made on five superimposed plies of this filter material and then permits a maximum resistance of 70 mm H₂O which is equivalent to a resistance of 14 mm H₂O for each ply of uniform material.

F. Characteristics of Filters

The filters were made either by wrapping the paper filter materials of low sheet-resistance in requisite numbers of layers around the chemical containers of radial-flow canisters, or by forming concentrically pleated or shell pleated filters of single ply sheets of higher-resistance filter material. Since the low-resistance papers were subject to damage in the machines for wrapping because of low tensile strength, the procurement specification was amplified to restrict acceptance to those papers having tensile strengths above a minimum value. Difficulties with wrapping were subsequently eliminated by depositing the pulp materials on a gauze fabric backing in the paper-making process so as to form an integral structure of gauze and paper with ample strength. The high-resistance material for the pleated filters was denser and strong, it commonly suffered no damage during the pleating and filter forming operations.

The content of asbestos fiber in the filter materials was 5 percent or more. Some qualifications of the filters are listed in Table 3. Data on DM smoke (diphenylaminechlorarsine) penetration is given for the canisters MIXA1; smoke penetration data for the subsequently improved types of canisters is omitted in accordance with the current classification policy.

1. DM Smoke Penetration Test

The "smoke test" (3) employing diphenylaminechlorarsine (DM) as the test medium is briefly described below as it has not been published before although it involves no changes in the general principles in testing canisters against gases or smokes disclosed earlier (8) (13).

The apparatus included an elevated constant-level reservoir and attached capillary tube for controlling the rate of outflow of a 0.2 percent solution of DM in acetone. The solution was delivered onto a metal plate maintained at 245°-250°C in a metal box within a well-ventilated hood. The DM vaporized from the hotplate and condensed to smoke in the concentration of a 0.1 mg./L. in the relatively cool air above; this air was drawn at the rate of 32 L./min. from the outside of the box into the compartment containing the hotplate. The

air and smoke passed through a baffle for mixing, into a compartment containing a test canister, and then filtered through the canister. The effluent air with any smoke that penetrated filtered through an asbestos mat of high resistance, formed on a fritted glass surface in a tube, and capable of restraining any residual smoke. After five minutes of operation the asbestos mat plus any DM was removed for arsenic determination by Gutzeit method. Milligrams of DM smoke per liter of air were reported.

a. Recent Filter Testing

Current filter test methods have considerably improved sensitivities, required now for quantitative measurements of the very minute penetrations through the modern U.S. Army gas mask canisters. The methods are based on photoelectric processes like that reported by Gucker (9).

V. CARRIERS

The carriers MIVA1, M6 and M8 were pouches made of water repellent duck fabric, and each was provided with a shoulder strap for support and a body strap to hold the carrier in a fixed position on the wearer. The openings for removal of facepieces, or complete gas masks, were provided with flaps and snap fasteners for closure. Unique features were introduced in the combat gas mask carrier M7 when a body of butyl rubber coated fabric with vulcanized seams was provided. The opening had a short tubular extension which could be rolled and then held tightly closed with snap fasteners. The closed carrier M7 was watertight and entrapped air gave sufficient buoyancy to support the weight of a man in the water. Saving the lives of numbers of soldiers is attributed to their buoyant gas masks when mishaps in landing operations caused immersion.

VI. THEORY

The theoretical aspects of adsorption of gases and vapors from gas-air mixtures flowing through granular adsorbents, and of the filtering of aerosols by fibrous filters like those in gas mask canisters has received

Table 3. Characteristics of U. S. Army Gas Masks.

Plies of Material Per Filter Assembly	Superficial Area Per Filter Assembly	Typical Resistance of Filter Assembly to Air Flow (b)	Filtering Efficacy With DM Smoke (c)		
			Concentration of Smoke in Air	Rate of Air Flow Through Canister	Penetration (Maximum)
10	sq. cm. 395	mm.H ₂ O 30	mg./L. 0.1	L./min. 32	mg./L. 0.000066
7	395	22	—	—	(f)
7	258	38	—	—	(f)
1 (g)	600 - 850 (h)	28	—	—	(f)

(f) Data on the penetrations through these filters is classified under the secrecy policy and cannot be published now.

(g) The single ply filters are concentrically pleated or shell pleated.

(h) 600 sq. cm. is a nominal area of the concentrically pleated filters and 850 sq. cm. of the shell pleated filters. The effective areas are much smaller due to occlusion of the peripheral pleats in the canister assembly, and occlusion adjacent to the creases of the filters caused by contacting surfaces of pleats.

much attention in the United States and abroad. Some important results are mentioned below.

A. Adsorption

Mecklenburg (15) expressed the relation between the depth of a column of granular adsorbent of uniform cross section and its life to the penetration of detectable gas when air containing the admixed gas passes through it at a uniform rate:

$$(1) \quad t_b = \frac{N_0 A}{L c_0} (z - h)$$

where t_b ="break-time", the time until a detectable concentration penetrates; N_0 =saturation capacity under the test conditions per unit volume of granular adsorbent; A =cross sectional area of the adsorbent; L =volume of air per unit of time; c_0 =concentration of gas in the influent air; z =thickness of layer; and h =depth of "dead layer", the thickness of layer in which the gas concentration decreases from c_0 to the detectable concentration after a steady state is attained.

Equation (1) indicates a linear relation between break-time and the depth wherein h is the intercept of the graph on the axis of thickness when break-time is plotted against thickness; some gas should penetrate immediately through beds of depth h or less, but not through deeper beds. Klotz (14) showed that the linear relation may be true for organic vapors; but not generally true as shown by some gas tests with absorbent beds thinner than those generally tested. Klotz (14) developed an equation to express the actual critical bed depth in terms of fundamental factors thus:

$$(2) \quad I = I_d + I_r = \frac{1}{a} \left(\frac{D_p V \rho}{\mu} \right) 0.41 \left(\frac{\mu}{\rho D_p} \right) 0.67 \ln \left(\frac{c_0}{c_b} \right) + k D_p \ln \left(\frac{c_0}{c_b} \right)$$

where I =critical bed depth, or the actual intercept of a life-thickness curve on the axis of thickness; I_d =fraction of the critical bed depth due to the slowness of diffusion of gas from air to the surface of the charcoal; I_r =fraction of the critical bed depth due to the slowness of processes occurring within the granules; a =superficial surface of granules per unit volume, ignoring pore structure; D_p = diameter of granules; V =linear velocity through the interstices between the granules; ρ =density of the gas-air mixture; μ =viscosity of the gaseous stream; D_v =diffusion coefficient of the gas in air; k =a constant; and c_b =concentration of the toxic gas in air, chosen as the "break" value.

Hinshelwood and collaborators (4) related the break-time, t_b , and the rate of flow of gas-air mixtures through columns of adsorbents of fixed dimensions, thus:

$$(4) \quad t_b = \frac{z N_0}{c_0} \left(\frac{1}{V} - \frac{1}{V_0} \right)$$

where V_0 is the minimum linear gas velocity within the granular body, which will produce immediate penetra-

tion. They also developed an equation (4) for the change with time of the concentration of gas escaping from an

$$(5) \quad C = \frac{c_0}{e^{-k c_0 T} \left(e^{k N_0 z / L} - 1 \right) + 1}$$

where c =concentration of the gas escaping from the column, and T =time.

Short and Pearce (16) extended the equation of Mecklenburg empirically to provide for the effects of variations in size of granules, variations in the rate of air flow and the type of gaseous chemical employed:

$$(2) \quad t_b = \frac{N_0 A}{L c_0} \left[z - g \left(\frac{L_e}{A_b} \right)^d \log \left(\frac{c_0}{c_b} \right) \right]$$

where g =a constant depending on the size of the charcoal granules; L_e =the steady flow rate equivalent to a pulsating flow actually used to stimulate breathing; A_b =the unobstructed cross sectional area within baffles to the flow of air, located at the effluent part of the charcoal in a canister as usually constructed and arranged for axial flow; and d =a constant depending upon the gaseous chemical agent employed.

B. Filtration

The relation between penetration of aerosols of uniform particle size filtering through fibrous filters and the filter thicknesses, was given by Katz, Smith and Meiter (13):

$$Q = q p \quad (6)$$

where Q =proportion of suspensoid passing a filter; q =proportion passing a single ply filter; and p =number of plies or units of thickness in a filter.

The theory of aerosol filtration has been extended much further by American investigators; but the information is in classified status and not available for publication.

VII. ACKNOWLEDGEMENT

Numerous individuals and organizations have contributed to the development of the U.S. Army service gas masks described above. The combat service gas masks were developed at the Chemical Corps Development Laboratory located during the war at the Massachusetts Institute of Technology. The others were developed at the Chemical Corps Technical Command, Edgewood Arsenal, Maryland. Several branches of the U.S. Army contributed by conducting service tests with various models made during the development process. The concentrically pleated filters and the shell pleated filters were developed respectively through research contracts with the United Shoe Machinery Company and the Dennison Manufacturing Company. Research contracts with the Arthur D. Little, Inc., C. H. Dexter & Sons, Inc., the Hollingsworth & Vose Co., and others led to improved filter materials. Charcoals and their impregnations were improved by Dr. W. C. Pierce and associates at Northwestern University, by Dr. P. H. Emmett and collaborators, at Johns Hopkins University, both groups of the National Defense Research Committee, and through research contracts with the Pittsburgh Coke & Chemical Co., the Carbide & Carbon Chemicals Corp. and the Barneby-Cheney Engineering Company.

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Military Government Control of the German Chemical Industry

Extracts from a paper read before a recent Technical Command seminar.

By L. WILSON GREENE

Scientific Director, Technical Command, Army Chemical Center, Maryland. Formerly Colonel, CWS and GSC; Chief, Chemical Section, Office of Military Government (U. S. Zone)

Since there has been so much criticism of our occupation policies in Germany, I thought you might like to learn some facts about the complex problems which faced our Army at the end of hostilities in Europe. I shall refer only to problems relating to the control of the chemical industry because that was the phase of the occupation with which I was associated. Needless to say there were comparable problems in all other industries, and in agriculture, mining, transportation, communications, finance, public health, education, and the like.

At the outset let me say that never before in the history of the world has an attempt been made to occupy and rehabilitate a modern industrial nation prostrated by total war. With her major cities practically destroyed, her railroads and communications completely disrupted, her canals choked with destroyed bridges and sunken barges, and her able-bodied manpower in prisoner-of-war cages, Germany was indeed prostrated and its economy was at a complete standstill.

To complicate further an almost impossible situation, the land area of Germany was divided into four zones of occupation, with the United States, Great Britain, France, and the Soviet Union each occupying a section of the country. Berlin was also divided into four occupation sectors, and the Bremen Enclave was established to give the U.S. a seaport. Perhaps you can realize some of the difficulties which resulted from drawing these national boundary lines across the German economy. Each of the four nations had its own objectives and methods of reaching them. In the early days of the occupation, interzonal trade was practically nil. Even in our own zone, we had set up the Eastern Military District (3rd Army) and the Western Military District (7th Army), and it was difficult to get commodities across this border too.

The basic documents governing the occupation of Germany were Joint Chiefs of Staff Memorandum 1067, and the Potsdam Declaration.

Briefly, these provided for the following activities relating to the control of the chemical industry:

1. Production of fertilizers and other materials necessary for growing and processing food crops.
2. Production of pharmaceuticals, soaps, and other commodities necessary for the public health.
3. Production of clothing and building materials.
4. Destruction of the German industrial war potential, with particular reference to military explosives, poison gas, munitions, synthetic oil, and synthetic rubber.
5. Reduction in the over-all industrial capacity to conform to a standard of living not higher than that of other European nations except the U.K. and the U.S.S.R., the excess plant capacity to be made available for reparations.
6. Elimination of all research except that necessary to achieve the objectives of the occupying powers.
7. Denazification of the entire industry, public and semi-public offices and important private undertakings.

The commodities to be produced under the control plan were to be delivered in accordance with the following priorities:

1. The occupying military forces.
2. Displaced persons still residing in Germany.
3. The nations overrun by Germany.
4. The German civilian population.

It might be mentioned here that the paralysis of the German chemical industry at the end of the war created serious economic problems throughout Europe. Practically every country was dependent on Germany for many essential chemical raw materials and finished products, and we in military government were under constant pressure to release commodities without regard to established priorities.

Now let's take a look at our first organizational structure which was set up to control the chemical industry. For the first four months of the occupation, there were three army organizations involved. These were:

1. Chemical Section, Production Control Agency, Office of Military Government

(U. S. Zone). I was Chief of this section. The Production Control Agency was a General Staff organization under the Assistant Chief of Staff, G5.

2. Chemical Warfare Service, Theater Service Forces, European Theater, reporting to the Theater Chemical Officer, General Rowan. Colonel Pat Powers was in charge of the Frankfurt headquarters.
3. The I. G. Farben Control Officer, reporting directly to the Deputy Military Governor, General Clay.

The Chemical Section had its headquarters at Hoechst, a small city near Frankfurt. We had branch offices at Heidelberg (Captain Brandt, CWS), Stuttgart (Lt. Wolf, CWS), and Munich (Major John Rollins, CWS, formerly assigned to the Information Division, Technical Command, early in the war). We also had a liaison office in Berlin in this first period. Edgewood officers who were sent over to assist me at headquarters were: Major Frank Hawkins, Major Lin Simerl, Captain Les Johnson, and Lt. George Cusack.

Before listing the responsibilities of the Chemical Section as they were evolved finally, I want to say that Colonel Powers' office in Frankfurt and the technical survey teams he sent out did an excellent job in gathering data on raw material inventories, plant capacities, bomb damage, etc., and in taking the initial steps in getting production of required commodities under way. He was ably assisted by Lt. Colonel Bigelow and several other CWS officers. These functions were transferred to the Chemical Section in September 1945.

The following were the specific duties and responsibilities of the Chemical Section in the fall of 1945:

1. Recommend policies and prepare directives and instructions for and supervise the control of production of chemicals in the U. S. Zone; recommend the removal, conversion or destruction of chemical equipment considered a dangerous war potential.
2. Consolidate requirements for production of chemicals (including raw materials, supplies and equipment for production of chemicals), for the Military Forces, for the minimum essential German civilian supply and for reparations and restitution; recommend changes and substitutions when requirements cannot be met.
3. Prepare plans for and supervise surveys to determine production capacity of the chemical industries, determine capacity required to produce approved production programs,

make recommendations as to facilities to be removed and disposed of as reparations, supervise and control removal of facilities, and maintain records of production capacity of industries.

4. Develop production programs jointly with Requirements and Allocation Officer and other production agencies; recommend assignment of production to Military Districts; check actual production as compared to programs; recommend necessary action to adjust production.
5. Recommend allocations of raw materials, supplies and equipment for production of chemicals.
6. Advise on technical aspects of decentralization of the chemicals industries of Germany.
7. Recommend policies, assist in preparing directives and instructions for denazification of the chemical industries and for use of German agencies in controlling chemical production.
8. Recommend policies for and prepare and supervise programs for preventing unauthorized production of chemicals.
9. Provide technical advice and supervise chemical production control activities in the U. S. Zone.

The Chemical Section was responsible not only for the entire chemical industry in the U.S. Zone, but for pharmaceuticals, vaccines, sera, rayon, rubber goods, plastics, paints, varnish, lacquers, soaps and cleansers and a long list of products including artificial window glass, roofing paper, synthetic sausage casings, photographic materials, and even pencils.

It is not an exaggeration to say that the entire German industrial economy rests on coal. German writers often say that coal is the mother of modern Germany. We soon found out that it was impossible to get the chemical industry back into production of essential commodities unless the flow of coal could be started from the mines to the factories. There were no coal mines in the U. S. Zone, except for the lignite mines in Bavaria, so it was necessary to negotiate with the British, French, and Russians in order to get coal from their zones in exchange for intermediates or finished products from our zone.

A typical example of the difficulties experienced by the Chemical Section in getting a product manufactured is shown by the case of calcium cyanamid. Cyanamid was used as an important nitrogen fertilizer in the prewar German economy. All during the war, very little nitrogen was used for the soil because of the tremendous

demands for this substance made by the explosives industry. Since the occupying powers were committed to maintain the health of the German population, the highest priority was placed on raising of food crops.

There was only one cyanamid plant in the U.S. Zone. This was located at the town of Trostberg in Bavaria. Late in August 1945, General Clay issued an order requiring that Trostberg be started up at once. Not one plant, but four plants had to be started. These were the lime plant, the carbon electrode plant, the calcium carbide plant, and the cyanamid plant; all in the Trostberg area. Coal or coke conforming to certain definite specifications was required to operate these plants. The only coal or coke available for this purpose in Germany was produced in the Ruhr in the British Zone. To operate Trostberg at capacity, 500 tons of special coal or coke is required per day.

We would get a trainload of specification coke consigned to Trostberg, but these trains would never arrive at the plant. It was found that this special fuel was being appropriated in Bavaria for local use. This situation was corrected finally, and in the last week in November, we began to produce cyanamid at 10 percent of plant capacity. Production was maintained at this level for about four weeks because that was all the coal or coke we could get. The cyanamid plant normally obtained its electricity from hydroelectric sources in that part of Bavaria. As the result of a long dry spell in the fall of that year, hydroelectric power was inadequate to run the cyanamid plant, and to obtain steam-generated power would require about 5,000 tons of coal per day. This, of course, was impossible so practically no production was obtained for the next three months. It was not until the spring of 1946 that any appreciable tonnage of cyanamid was produced and, even then, we could not get the rate above 20 percent of capacity.

The complexity of the German chemical industry is best illustrated by the well-known I. G. Farbenindustrie. I. G. Farben was the largest corporation in the world. I mentioned earlier that the I. G. Farben Control Officer was a member of the organization set up to control the chemical industry. His function was essentially legal and he and his organization became the receivers for the defunct I. G. The Chemical Section was still responsible for production control and the destruction of the war potential.

The records show that I. G. Farben was Germany's principal producer of war materials. Its vast chemical productive capacity was converted to war purposes and, in addition, it constructed

and operated most of the explosives and poison gas plants in Germany. The corporation maintained the most elaborate patent system the world has ever known and, with its extensive research facilities and its leading role as a chemical producer, I. G. Farben dominated all German cartels. It was likewise the largest participant in international cartels. Investigations of I. G. records by the Control Officer showed participation in about 2,000 cartel agreements in Germany and throughout the world.

I. G. Farben was evolved as a result of a merger of six of the largest chemical concerns in Germany. It was incorporated in December 1925 with headquarters in Frankfurt a/Main. Since 1925, a number of other organizations came under I. G. control either by direct absorption or stock ownership. By 1937, its net worth was estimated to be approximately two and one-half billion dollars. Before the war, about 200,000 people were employed by I. G. and its subsidiaries, and this figure was doubled during the war.

The following paragraphs pertaining to the organization of the I. G. have been taken almost verbatim from a military government report:

The corporation was managed by the Vorstand, consisting of 21 members. There was also a supervising board of directors known as the Aufsichtsrat, consisting of 16 members. The three other principal governing bodies consisted of KA (Commercial Board), TeA (Technical Board), and the OA (Far Eastern Board).

A large measure of financial and economic control was exercised by an office known as "I. G. Berlin NW 7." This office, under the management of Dr. Max Ilgner, a nephew of the president of I. G., operated a Central Financial Department, a Statistical Department, and a Political Economics Department. The office symbolized the rise of financial and commercial power within the I. G., as compared with the prior domination of the corporation's management by scientific and technical personnel. The Deutsche Laenderbank, on Unter den Linden, adjoined I. G. Berlin NW 7. This bank was actually dominated by I. G., although legal control is denied. The activities of the Economics Department included industrial espionage in Germany and throughout the world. In this manner, I. G. kept its widespread organization informed of important developments. The Reich Ministries are believed to have frequently utilized this office.

Technical control of production was su-

pervised by three "Spartes": Sparte I, comprised nitrogen, gasoline, mineral oils, and coal mines, with headquarters at Leverkusen; Sparte II, comprising dyestuffs, inorganic and organic chemicals, medicines, and pharmaceuticals, had its headquarters at Frankfurt; and Sparte III, comprising photographs and artificial fibers, had its headquarters at Wolfen.

All plants of I. G. in Germany were divided into regions, of which there were four; namely, Lower Rhine, Upper Rhine, Main Area, and Central Germany. Each region was known as a "Works Combine." As a rule, the plants were not concerned with sales or profits, but were merely operated on the basis of producing in a most efficient manner possible.

There were five principal Sales Combines within the I. G. organization; namely, Chemicals Combine; Dyestuffs Combine; Pharmaceuticals Combine; Photographic Supplies and Artificial Fibers Combine; and Nitrogen, Minerals, and Oils Combine.

An important and novel feature of I. G.'s management was the "criss-cross control." Thus, any one of the three Spartes could direct the activities of any plant in any of the four Works Combines in respect to the products of the type assigned to that Sparte. Similarly, each plant in each of the four Works Combines could deal with each of the five Sales Combines in respect to the products handled by that combine. Finally, the Central Finance Office in Berlin and the Central Bookkeeping Office at Frankfurt had the task of controlling fiscal affairs for the entire gigantic corporation. Needless to say, innumerable special arrangements, based on geographical convenience, economy measures or long customs and usage, brought about exceptions to the board lines of criss-cross control. However, these main lines of direction, complicated as they were, were generally followed.

The foregoing has been presented in some detail in order to give you an idea as to the task facing American Military Government authorities when they took over all assets of I. G. in the U.S. Zone. On 5 July 1945, pursuant to Military Government Law No. 52 and Special Order No. 1, a control officer was appointed in the U.S. Zone to seize the possession, direction, and control of the assets of I. G. in the U.S. Zone, pending the assumption of control by a four-power council. Thus, I. G., as such, ceased to exist in the U.S. Zone on that date. Forty-two major manufac-

turing plants, 56 sales offices and 26 other major installations were seized along with all available records of this huge corporation. Six months after seizure, the collection of records comprised about 20,000 books and 80,000 files of publications and correspondence. In addition to these records, approximately 6,000 patents and 9,000 patent applications belonging to I. G. were also taken over.

At the end of the war, there were 42 major manufacturing plants in the U.S. Zone which were either owned, controlled, or operated by I. G. A major plant, as defined for this purpose, is a manufacturing installation employing 100 or more persons.

MAJOR I. G. PLANTS

Heavy chemicals, dyestuffs, intermediates, solvents, plastics, pharmaceuticals, vaccines, fertilizer, rayon, liquid fuels, abrasives, tanning materials, and insecticides	17 plants
Military explosives	11 plants
Mustard gas	1 plant
Miscellaneous munitions	6 plants
Other products (cameras, industrial explosives, building supplies, etc.)	7 plants
Total	42 plants

I. G.'s former interest in these 42 plants was as follows:

Owned and operated by I. G. (parent company)	10
Owned and operated by subsidiaries which were 100% I. G. owned	3
Owned and operated by subsidiaries which were 50% or more I. G. owned	4
Owned and operated by subsidiaries which were less than 50% I. G. owned	3
Owned and operated by Dynamite A.G., of which I. G. had 64% voting control (not included in the above categories)	3
Owned and operated by subsidiaries of Dynamite A.G.	5
Owned by the German Reich (Montan) and operated by I. G. or its subsidiaries	14

Total

42 plants

Of the 28 plants owned by I. G. and its subsidiaries, 7 plants, employing at normal capacity approximately 7,000 persons, were offered for reparations, subject to four-power approval. All special purpose equipment specifically designed for producing munitions and other war-making products, such as shell-loading machinery and equipment for the production of poison gas, was

to be destroyed prior to the delivery of such properties for reparations. This represents a 25 percent reduction in the number of plants in the U.S. Zone in this category. One additional plant was practically destroyed during the hostilities. Of the 14 Montan plants (Reich owned—I. G. operated), two large plants were destroyed by U.S. Army demolition teams before the end of 1945, and the general-purpose equipment in the remaining 12 was offered for reparations, subject to four-power agreement. After removal of the general-purpose equipment for reparations, all war-producing installations, including powder magazines and storage facilities, together with special equipment therefor, were recommended for demolition.

Of the 42 major manufacturing plants in the U.S. Zone, 21 plants, or 50 percent, were either destroyed or offered for reparations. This represents approximately 52 percent of the former manufacturing capacity of I. G., based upon employment statistics. The 21 plants thus declared available for reparations were a part of the German war-production machine, or were clearly in excess of the German peacetime requirements.

In addition to the 42 plants described above, there remained at the end of 1945, 26 former I. G. installations in the Zone, each employing less than 100 persons, comprised as follows:

1. Six small industrial gas plants manufacturing oxygen, nitrogen, hydrogen, acetylene, compressed air, etc. Subsequently, two of these plants were offered for reparations.
2. Three small pharmaceutical plants. It was planned to retain these for the peacetime economy.
3. Two small industrial explosives plants. One was to be retained temporarily for the manufacture of blasting power for use in quarrying. The general purpose equipment in the other was offered for reparations.
4. One obsolete synthetic camphor plant, which was found to have no value for reparations purposes.
5. Three photographic laboratories. It was recommended that they be retained.
6. Two research laboratories. It was planned to dismantle these.
7. Five mines. Retention was recommended.
8. Three hydroelectric power plants. These were needed for the peacetime economy.
9. One main office building in Frankfurt. This was headquarters of the American occupation forces.

The other zones followed the lead of the Amer-

ican military government, and today I. G. Farben no longer exists. Its processes and patents are available to the allied powers for public exploitation, and the Associated Press reported on September 2, 1946 that even the use of the I. G. name and trade-mark was forbidden. The same press dispatch announced the final dissolution of the corporation.

When the Chemical Section was transferred to Berlin in November 1945, the War Department was hoping to transfer all military government activities to the State Department. An American civilian was placed in charge of each of the key activities and officers were being replaced by civilians as rapidly as qualified personnel could be recruited. Dr. Albert B. Newman, former Dean of Engineering of the College of the City of New York, was placed in charge of the Chemical Section. He spent his entire time in quadripartite negotiations with the British, French, and Russians concerning over-all policies pertaining to level of industry, reparations, and the like. This left me free to devote my time to the other responsibilities of the Section, with particular emphasis on getting chemical control organized at Laender or province level so that the Germans could run their own economy under a minimum of military government supervision. This was well under way when I left Berlin in February 1946.

At the beginning of this article, I mentioned the criticism in the States concerning our policies. We got quite a blast in the American press when we started up a small dynamite plant to make explosives for blowing bridge wreckage out of rivers and canals. The other alternative was to import the dynamite from the U.S. at taxpayers' expense. At another time, we received a cable from the American Ambassador in Moscow stating that all the Soviet newspapers were giving front-page space to a story that the Americans had started up the largest explosive plant in our zone and that the Germans were again making high explosives, fuzes, and munitions. On the same day, we received an urgent cable from the War Department in Washington saying that the American papers were carrying the story and demanding an explanation.

Investigation showed that some young energetic military government officer in Marburg had got the Germans to collect all the waste, inedible fats in that area and had set up a couple of kettles in one of the buildings of the huge Allendorf explosives plant, and was turning out soap for the local populace; a very commendable activity since the soap ration was on the basis

(Continued on page 55)

BATAAN SURVIVOR TAKES CC COURSE



Lt. Jesus Pelausa, former Philippine guerrilla and survivor of the infamous "Bataan Death March," is attending the Advanced Course at the Chemical Corps School. He was captured on Bataan in 1942, and was held in a Jap prison camp for six months after the "Death March" before making his escape.

Suffering from malaria and beri beri, because of ill-treatment and lack of food, he spent three months in hiding before he was able to join a guerrilla unit.

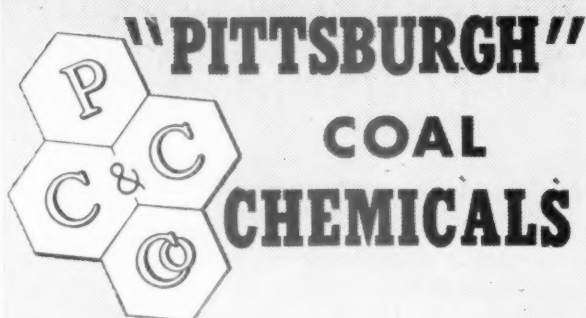
Lt. Pelausa served three years with the Philippine guerrillas before reporting to Military Control in 1945. During this period he took part in numerous scouting and raiding parties, which gathered information concerning position and strength of Japanese forces, as well as constantly harassing enemy supply lines and ambushing Jap forces in rear areas. They helped all of the young men in the area escape into the jungle to keep them from being conscripted by the Japanese for labor battalions.

He had several close escapes. On one occasion Japs surrounded the house in which he was hiding. Armed with only a hand grenade and a bolo knife, he jumped from a window and escaped into the nearby jungle with a sprained ankle as his only injury.

During the liberation operation, Lt. Pelausa's unit staged its final attack. As Japanese reinforcements were being brought ashore in landing craft, American planes strafed and bombed the ships. The survivors, swimming and wading ashore, were wiped out to a man by the Guerrilla Unit.

On August 9, 1947 he married an Army Nurse in Luzon. She served during the war with the Philippine Army on Bataan, and was awarded the Purple Heart for wounds received there. She is now at the 53rd Station Hospital on Luzon.

Lt. Pelausa is a member of a Philippine Scout Unit in the United States Army, assigned to the Chemical Corps. He holds the Distinguished Unit Award with two Oak Leaf Clusters, the American Defense Ribbon with a Bronze Star, the Asiatic-Pacific Ribbon, the Philippine Liberation Ribbon, and the World War II Victory Medal.



AROMATIC HYDROCARBONS:

Benzol, Toluol, Xylol, Naphthalene

TAR ACIDS: Phenol, Cresols

SULPHURIC ACID: All Grades

TAR, PITCH and CREOSOTE

SULPHATE OF AMMONIA

TAR BASES: Pyridine, Picolines

SODIUM CYANIDE

SODIUM THIOCYANATE

PHTHALIC ANHYDRIDE

ACTIVATED CARBONS

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Chemical Procurement in the New England States

The Boston Procurement District, 1924-1947

In the early twenties it was recognized that this country must be prepared to meet a full wartime production demand in case of a national emergency and Chemical Warfare Service Procurement Districts were set up by OC-CWS for the mobilization of industries to meet this objective insofar as CWS materiel was concerned.

First Lt. Alden H. Waitt (now Maj. Gen. Waitt, Chief of the Chemical Corps) was assigned as Executive Officer of the first Boston Chemical Warfare Procurement District on 1 January 1924. This District comprised the six New England States.

The organization of each Chemical Warfare Procurement District called for a District Chief and an Executive Officer. The District Chief in each case was a civilian who devoted only a very small percentage of his total time to War Department activities. Executive Officers were members of the Regular Army whose duties included surveys of facilities, training of reserve officer personnel in procurement planning duties, preparation of accepted schedules of production, lectures before reserve officer meetings, and duties as assistant to the Chemical Warfare Officer of the Corps Area.

The first District Chief of the Boston District was Mr. Howard Coonly, appointed in August 1925, who was at that time president of the Walworth Manufacturing Co. The Honorable Charles Francis Adams of Concord, Massachusetts, former Secretary of the Navy, and Mayor of the City of Quincy, became the second civilian District Chief of the Boston District on 28 March 1934.

Previous to 1 July 1940, the maximum office force consisted of three civilian employees and the Executive Officer. The quarters occupied consisted of approximately 500 square feet of floor space. The functions of the district office were limited to procurement planning activities.

With war declared in Europe, the Boston office began actual operations with an educational order contract for gas masks, which had been awarded by OC-CWS to the Firestone Rubber & Latex Products Co., Fall River, Mass., in the latter part of August 1940. A contracting officer was appointed with authority to act for the Govern-

ment in awarding contracts. With this authority came the institution of the Legal Division, and the first district contract was awarded on 23 August 1940 to the Acushnet Process Co., New Bedford, Mass., for the construction of molds to manufacture the new fully-molded faceblanks developed by the Chemical Warfare Service.

In the year prior to 7 December 1941 the Boston District grew rapidly and, with the resources of industrial New England behind it, became one of the leading procurement districts of the service. The average expenditures of the district for this period were \$500,000 per month. Industry was being mobilized and educated for the war of production which was soon to come.

The Boston District had two gas mask assembly plants, two incendiary bomb plants, and a number of component manufacturers on a full scale production basis when war came. These were immediately augmented, as is indicated by the fact that during the month of December 1941 a total dollar value of \$15,878,319.76 was placed.

The Boston District at once went on a wartime footing. On 20 December 1941 Lt. Col. S. E. Whitesides, Jr., was appointed Commanding Officer of the District. (Col. Lester W. Hurd succeeded him in September 1944 and was in turn succeeded on 1 July 1946 by Lt. Col. Henry R. Sanford, its final Commanding Officer.) Additional divisions were set up to administer personnel, communication services, records and files; to survey additional manufacturing facilities and to negotiate and award contracts; to prepare legal documents and to review and approve all actions involving legal questions; to plan, control and expedite production, furnish technical advice and assistance to contractors, and assist contractors in obtaining necessary materials and equipment; to supervise, coordinate and administer all transportation activities; and to maintain plant protection and safety; and to perform necessary military intelligence functions. Soon there were 77 officers and 691 civilian employees in the District office and it was functioning on a seven-day basis.

By February 1942 the volume of procurement necessitated the rental of a storage warehouse. Approximately 250,000 square feet of warehouse space was leased in Lawrence, Mass., for the storage of components and end items. Up to this time all testing of materials had been con-

ducted either at the CWS Development Laboratory at Massachusetts Institute of Technology, Cambridge, Mass., or at various plant laboratories. Under the pressure of expanding procurement, the district established its own testing laboratory in Boston. This laboratory occupied approximately 4,200 square feet of floor space and was completely equipped with facilities to test all types of materials and components as required by CWS directives and specifications. These testing facilities were made available to manufacturers desirous of improving their production facilities and quality. Close contact was maintained with the CWS Development Laboratory to check results to see that the quality of work was maintained at a high level. The facilities were also made available to the Boston Inspection Office for the testing of accepted items and much duplication of work was avoided.

During the spring of 1942, among the many plants having contracts with the Chemical Corps the following assembly plants in the Boston District were in full scale production:

Firestone Rubber & Latex Products Co., Fall River, Mass.; gas mask assembly.

Sprague Specialties Co., North Adams, Mass.; gas mask assembly.

National Fireworks, Inc., W. Hanover, Mass.; incendiary bombs.

Hub Hosiery Mills, Lowell, Mass.; gas mask assembly.

Acushnet Process Co., New Bedford, Mass.; gas mask components.

Fisk Tire & Rubber Co., Chicopee, Mass.; gas mask assembly.

Added to the above at later dates were:

The Morley Co., Portsmouth, N. H.; gas resistant sack and eyeshields.

The United-Carr Fastener Corp., Cambridge, Mass.; gas mask hardware.

Worcester Molded Plastics Co., Worcester, Mass.; component plastic parts for gas masks.

Bemis Bros. Bag Co., East Pepperell, Mass.; gas resistant sack.

International Silver Co., Meriden, Conn.; factories at Florence, Mass.; Meriden, Conn., and Wallingford, Conn.; incendiary bombs.

Casco Products Co., Bridgeport, Conn.; 4.2 fuze.

The Verplex Co., Essez, Conn.; M69 cluster.

Handy Pad Supply Co., Worcester, Mass.; M6 gas mask carrier.

Atlas-Ansonia Co., W. Haven, Conn.; 4.2 fuze loading.

Mason Can Co., E. Providence, R. I.; bomb components.

Before the war was over, many other companies in the New England area had been drawn

into the Chemical Warfare procurement program. Outlet valve guards for the gas mask were made at the Worcester Molded Plastics Co.; 10,000 nose cups a day for the masks were produced at the Kleistone Rubber Co.; M10A1 canisters were manufactured at the Mason Can Co., and the Hub Hosiery plant received masks returned from overseas and reconditioned them for reissue. United-Carr Fastener Corp., H. O. Canfield Co. and Scovill Manufacturing Co. built gas masks for war dogs, while other New England plants produced gas masks for cavalry mounts. The A. S. Campbell Co. produced 4.2 mortar shells. More than 6,000,000 M69 jellied gasoline incendiaries, singly and clustered packages, poured out of the International Silver Co. plants, and its Florence plant produced magnesium bombs at the rate of 30,000 a day. Still other International plants made the famous M74 "synthetic lava" incendiaries.

The high point of war output came in July 1943. At this time the organization was at peak strength with 125 officers and 1126 civilian employees in the district.

The progress of procurement activities and the total dollar value of contracts placed by the Boston District are indicated in the following table:

Year	No. Contracts	Dollar Value
1940	205	\$ 2,927,145.47
1941	858	25,971,847.74
1942	2,224	37,588,969.41
1943	1,958	41,415,787.54
1944	763	33,965,431.01
1945	647	64,694,432.57
	6,655	\$206,563,613.74

On 13 May 1943 in accordance with a directive from the OC-CWS, a separate Inspection Office was established in the Boston District. Military and civilian personnel assigned to the Inspection Branch of the district were transferred to the new Boston Inspection Office. This Inspection Office became responsible for all inspections, acceptance or rejection of material procured by the district. Disciplinary and administrative jurisdiction over personnel were exercised by the Commanding Officer, Boston Chemical Warfare Procurement District, but the Boston Inspection Office was directly responsible to the Inspection Division, OC-CWS, for the technical functions performed.

Effective 1 September 1943, the military and civilian personnel allotments for the District were reduced. With the drastic cut in both civilian and military personnel a consolidation of division functions was required. By December

1944 the Boston District had reduced its military and civilian personnel to 54 officers and 165 civilian employees. To these must be added the 14 officers and 226 civilians in the Boston Inspection Office.

In general, the attitude of New England manufacturers in connection with procurement activities was one of complete cooperation in striving to give us the items wanted on time or ahead of schedule. When changes in schedules made it necessary to cancel contracts, other important war work was found to fill the gap, with very little time lost. In order that settlement be made as expeditiously as possible after termination so that business capital would not be paralyzed pending the ironing-out process, a Readjustment Division was set up in October 1944 consisting of three branches—Terminations and Negotiations, Property Disposal and Demobilization.

In mid-April 1945 a salvage unit was established at Fort Devens, Mass., for the purpose of dismantling gas masks. Additional personnel were assigned to the Boston District to operate this salvage unit.

With the cessation of hostilities on the European Continent, the rate of terminations increased and the Boston District geared itself to settle its contracts smoothly, swiftly and efficiently in order to allow smaller business to convert to peacetime production as soon as the war in the Pacific was won. To accomplish this end, complete discretionary powers were vested in the Contracting Officer to handle the innumerable problems that arose out of settlements.

In August 1945, following victory in the Pacific, Colonel Hurd, Commanding Officer of the District, said, "The end of this, the greatest war in history, came with such suddenness that we have not yet been able to grasp the full meaning that it is all over. Our people, both in the Chemical Warfare Service itself and in the many hundreds of war plants in New England engaged in making war material for CWS, have been working at top speed getting out our greatest incendiary bomb and 4.2 mortar shell production since Pearl Harbor. We know that the millions of fire bombs produced here and delivered to the Pacific have hastened the capitulation of the Japanese empire. We were ready to produce in the next 12 months the greatest weight of incendiary bombs in our history, some 800,000 tons or, in long count, some 150,000,000 fire sticks. These alone would have left nothing but charred ruins of the Japanese mainland as well as Japanese-occupied territory. We are now devoting our entire organization to the speedy termination of war contracts. It is our expectation to clear plants, without delay, of

government equipment and materials, settle the claims of the contractors, and allow quick reversion to civilian production and the return to the peaceful way of life."

At once termination multiplied and with almost complete cessation of procurement in the district readjustment work, involving the proper settlement of contract termination claims, and the disposal of excess property and materials, became the main activity of the district. Army Service Forces had directed that four months after V-J Day all contract claims be settled, and it was towards this goal that the entire District directed its efforts.

With this curtailment of operations, total personnel in the Boston District was reduced from 65 military and 403 civilians on 31 July 1945 to 35 military and 41 civilians on 31 December 1945. Inactivated were the Procurement Division, Industrial Relations Division, and the Boston Inspection Office, and the remaining divisions were consolidated in October 1945. By 16 January 1946, other changes included the abolishment of the testing laboratory in Boston and the release of floor space at the warehouse at Lawrence.

In order to make the tremendous changeover from production work to contract settlement, the Readjustment Division of the Boston District was expanded rapidly in accordance with previous V-J Day plans. Personnel was transferred from other divisions to handle the various phases of contract settlement activity. Production men were assigned to carry out the disposal of property in the plants and other related tasks. Key personnel were borrowed from the Legal and Fiscal Divisions.

By 1 September 1946 complete demobilization of the district had been effected. Office space, which at the height of activities had been 20,700 square feet, was almost back to prewar size or approximately 1671 square feet. The 3 officers and 10 civilians in the district office in September were further reduced by 1 January 1947 to 2 officers and 6 civilian employees. A year and a half had passed since the end of the war.

From 1 July 1946 to date the main activity of the Boston District has been procurement planning for active procurement of items required by the Chemical Corps in the event of another national emergency. All procurement schedules of intent marked for New England procurement have been duly accomplished and placed with potential contractors throughout New England.

The Boston Chemical Procurement District was deactivated as of 26 July 1947 and its mission transferred to the New York Chemical Procurement District.

MOBILIZATION—CHEMICAL INDUSTRY

(Continued from page 5)

plans recognize the essential factors which must be considered in making detailed plans in the chemical industry. A large chemical plant can not be shifted to essential war needs as readily as a machine shop. Now material, equipment, technical personnel, proposed complete war load are all factors that need careful planning to insure speedy and efficient utilization of our potential chemical capacity in a future emergency. The Chemical Corps Association will perform a very vital part in our industrial preparedness in acting as the chemical channel to and from industry.

DIRECTORS MEET IN NEW YORK

(Continued from page 4)

Charles E. Pledger, General Counsel, CCA, Washington, D. C.

Robert Porter, President, Camp Detrick, Md., Chapter.

Maj. Gen. William N. Porter, retired Chief, Chemical Corps.

W. L. Rippeteau, Wyandotte Chemicals Corp., representing Michigan Chapter.

Mayor Carl W. Rich, President, Cincinnati Chapter.

Harold B. Rodier, Editor, Chemical Corps *Journal and News*.

R. Donald Rogers, Vice President, Chairman Finance Committee.

Clifford L. Sayre, Buffalo Electro-Chemical Co., Vice President, Chairman War Mobilization Committee.

John H. Schaefer, Vice President Ethyl Corp., represented by Mr. Costello.

I. Chenery Salmon, Secretary-Treasurer Boston Chapter.

Joseph Schwimer, Secretary-Treasurer CCA.

L. T. Sutherland, Barrett Div., Allied Chemical & Dye Corp., New York City.

John J. Stockett, President, Washington Chapter.

Harlan N. Worthley, Merck & Co., Rahway, N. J.

Philip E. Young, President, Acushnet Process Co.

M. Morrisroe, Oronite Corp., representing San Francisco Chapter.

Mrs. Viola Lounsbury, New York Chemical Procurement District, Recorder.

The Ethyl Corporation was host to the directors prior to the dinner which was served in the main dining room of the club.



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Furnaces

Kilns

MANUFACTURERS OF

Porcelain Enamel Frit

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Porcelain Enamel

Clay Products

Glass

Plastics

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Chemicals

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LEGION OF MERIT TO GENERAL MONTGOMERY

Brig. Gen. Edward Montgomery, Army Air Forces Chemical Officer, was presented the Legion of Merit by Maj. Gen. Alden H. Waitt, Chief, Chemical Corps, on 4 September 1947, for his outstanding services as Chief, Field Service, Chemical Warfare Service, from 7 December 1941 through February 1942, and as Chief, Technical Service, Chemical Warfare Service, from February 1942 through May 1942. "By his skillful handling, organizational talent and executive ability he successfully guided the expansion of these divisions. Through his keen and brilliant analysis of the many problems presented by a large and rapid growth he established a solid foundation that was greatly responsible for the success of these highly important divisions, and



the outstanding record established in research and development."

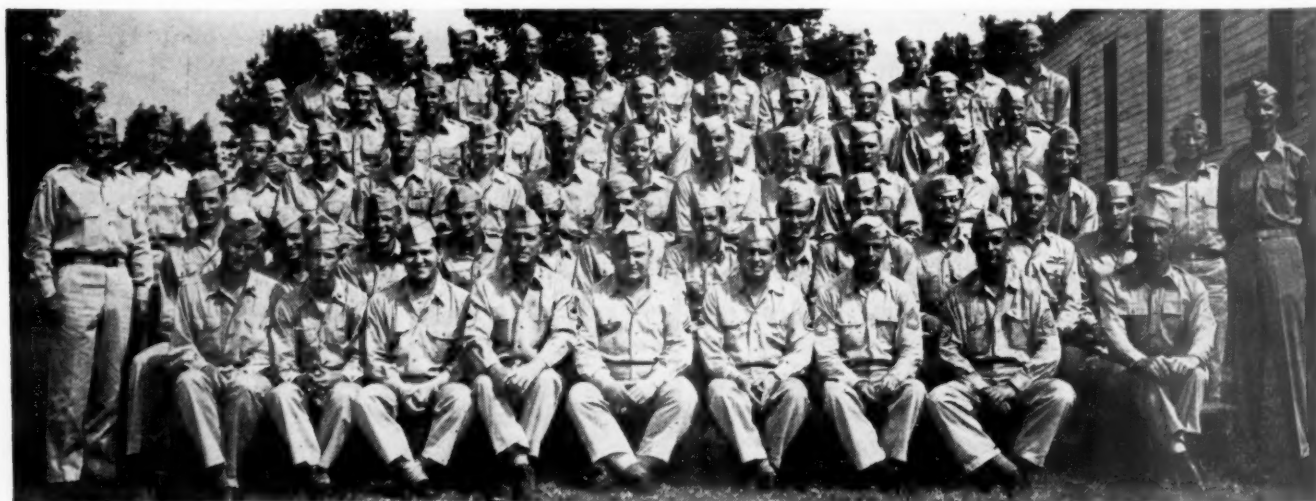
FIRST CHEMICAL CORPS ROTC CLASS SINCE WORLD WAR II

Forty-six students attended the six-week Chemical Corps Reserve Officers Training Corps Camp at the Army Chemical Center, Maryland, this year.

Three students, Cadets Henry A. Harbury, Thomas D. Cantrell and Henry L. Shields were personally awarded their commissions as second lieutenants in the Chemical Corps Officers Reserve Corps by Brig. Gen. E. F. Bullene, Commanding General of the Army Chemical

Center, Maryland, at graduation exercises held on the post parade grounds at 10:30 a.m., Thursday, 31st July.

The other 43 cadets, from 17 colleges and universities, representing 19 states, completed that part of their R.O.T.C. training which comes between the 3rd and 4th years of their senior R.O.T.C. course, and which upon completion of their college courses will entitle them to commissions as second lieutenants in the Chemical Corps Reserve.



Standing left: Major Arent O. Welken, Cml.C., Instructor; Major Joseph C. Braxton, Cml.C., Instructor. Standing right: CWO Alex N. Mraz, Adjutant; Major Jack F. Lane, Commanding Officer of the R.O.T.C. Camp.

First row: Cadre: Cpl. Mathew B. Easter, Plc. Allen Robbins, Cpl. William A. Pappas, M/Sgt. Claude R. Misenheimer, T/S John Hager, S/Sgt. John B. Swink (Inf.), Tech/Sgt. Samuel L. Frey, 1st/Sgt. Joseph W. Costello, 1st/Sgt. Ike Howard.

Second row: John W. Weil, Walter O. Tofani, William R. Thomas, Paul E. Rowe, Thomas A. Solak, Walter L. Van Nostrand, Jr., Henry L. Shields, Kelsie O. Roach, John H. Stevenson, Jr., Hogan A. Randle, James H. Perkins, Kurt L. Seligman.

Third row: Francis C. Marcoulides, Jack I. Mayer, James P. Woodson, Franklin E. Mange, Cecil G. Miller, Jr., Benjamin P. Miller, Virgil O. McMillan, Richard N. Miller, Donald F. Molino, Leon Moss, Jr., Donald J. Nelson, Jr.

Fourth row: James H. Landon, Donald K. Kuehl, Don Hodges, Arthur F. Kirby, Robert E. James, Jr., John W. Kenney, David B. Kellom, Phillip A. Horrigan, Herbert M. Herzhenson, Ellis L. Hawk, Henry A. Harbury.

Last row: William H. Darnell, Owen A. Barnes, Dimitri D. Allegretti, John C. Bowen, Stanley J. Adelstein, Edward F. Cluff, Sheldon L. Green, Boyce M. Bennett, Charles H. Brekus, George W. Doyle, Thomas D. Cantrell, Leslie W. Cline.

"Industry-Army Day," Ft. Lewis, Wash.

Patterned on the first such meeting which took place in Chicago last January 17th, a second "Industry-Army Day" program was recently concluded at Fort Lewis, Wash. Over 500 leading industrialists of the Pacific Northwest gathered together September 12th under the sponsorship of seven military associations to hear a first-hand report on industry's relationship to the National Security Program as presented by a prominent group of Army representatives.

Acting on General Eisenhower's wholehearted endorsement of the Chicago meeting, Col. Albert H. Hooker of the Hooker Electrochemical Co. in Tacoma, and a member of the Tacoma Chapter of the Chemical Warfare Association, chairmanned a program committee of six other military associations to hold this first regional meeting in which the opportunity could be afforded business and military leaders to discuss problems of mutual interest. Fort Lewis, ideally suited for a gathering of this kind, played host to the eminent group of industrial executives and scientists. Maj. Gen. Paul W. Kendall, commander of the Second Infantry Division, made available all the splendid facilities of Ft. Lewis to Col. Hooker and his associates to insure the success of the program.

Prior to the formal opening of the afternoon session of the conference, the Second Division passed in review before the visiting assemblage. Formations of C-82 aircraft, the famed "flying boxcars," flew over the heads of the marching troops, giving civilian guests an impressive background with which to start the day's program.

Following a luncheon in the Post Officers' Club in which greetings of welcome were expressed by General Kendall and Colonel Hooker, the conference moved to the Post Theater to hear the principal speakers of the day. Gen. Mark W. Clark, Commanding General of the Sixth Army, led off with a treatment on the "Situation In Austria." The difficulties of military government under a quadripartite administration wherein one of the occupying powers pursues a negative course of action were traced in detail by General Clark.

Maj. Gen. Henry S. Aurand, director of the newly-created Research and Development Division of the Department of the Army's General Staff, outlined the operational procedures of his office with respect to scientific research being carried on by private enterprise. Explaining that most of the Army's research projects are of necessity geared to a long range program in order to stay ahead of international competitors, the General stated that his Division has placed the

majority of research contracts with industrial concerns possessing the facilities and know-how.

The role of air power in the national security was outlined by Maj. Gen. Emmett O'Connell, Director of Information, Air Forces. Commenting on the fact that rapid demobilization of the air forces after the last war left that establishment a skeleton of its former self, the General stated that the development of new types of aircraft and air weapons through a joint industry-air forces research program was the only means of keeping America ahead in terms of military air strength.

Lt. Gen. J. Lawton Collins, newly-appointed Deputy Chief of Staff of the United States Army, concluded the afternoon session with a syllabus of all the factors affecting the national security program. Based on the lessons learned in the last war and the prospects of the nature of future warfare, General Collins, in precise, direct terms defined the needs of the armed forces for the present and the period just ahead. He underscored the principle that the problems of national security were not alone the concern of professional men within the armed services but rather that the people, and particularly those who produce to sustain the material needs of the military establishment, should and must concern themselves in maintaining a proper military posture. Whatever the Army is, explained the General, it is the creation and the servant of the people. Quantity and massiveness, he declared, was not the goal of those directly charged with preparedness wherein an excessive tax burden would be mandatory to support a topheavy military organization. Rather, General Collins pointed out, it is desirable to formulate our plans on the basis of holding to a small, highly trained, professional striking force and having ready large numbers of trained civilian components capable of taking the field on short notice without the necessity of retraining these components in basic doctrine.

The evening session began with a reception and a dinner given again in the post officers' mess. Featured on this part of the program were the Technical Service Chiefs, including Maj. Gen. A. H. Waitt, Chief of Chemical Corps; Maj. Gen. E. S. Hughes, Chief of Ordnance Department; Maj. Gen. T. B. Larkin, Chief of Quartermaster Corps; Maj. Gen. William M. Hoge, representing the Chief of Engineers; Maj. Gen. E. H. Leavey, Chief of Transportation Corps, and Brig. Gen. C. H. Arnold, representing the Chief of Signal Corps. Each of these officers was introduced to

the assemblage by U. S. Senator Harry B. Cain of Washington and spoke briefly on their own respective technical services and their relationship to the over-all national security program as previously outlined in the afternoon session.

Whereas the afternoon speakers presented the broader aspects of the armed services' program for preparedness, these Technical Service Chiefs were available throughout the day to meet informally with small groups of industrial representatives most intimately concerned with their respective activities.

Of particular interest in the remarks of the after-dinner speakers was the presentation made by Major General Waitt. Harking back to General Collins' earlier emphasis on the importance of maintaining a proper military posture as a deterrent to war, General Waitt recalled that "we won the gas war without firing a gas shell or dropping a gas bomb because we were better prepared to wage that war than the enemy. I believe this is an important lesson for the American people," he said. With respect to co-ordination of research and development projects between the armed services and industry, the General counseled, "Most of your research, however, is applied research and directed toward the solution of problems which will result in immediate, tangible products you can manufacture.

"In addition to this applied research, I am convinced that industries should guide their efforts into basic lines. The research effort of every large organization should be devoted in part to fundamental problems. Many big companies are doing this today. General Electric and American Telephone, for example, are spending large sums in basic studies which will not result in any immediate product.

"Our nation can only progress in science if we solve the *fundamental* problems of science. If our industries do not do their share along with the educational institutions and government agencies in conducting basic research, this country may lag a long way behind."

In concluding the day's events, J. P. Weyerhaeuser, President, Weyerhaeuser Timber Co., addressed several brief remarks to the assembled guests. In assessing his view of the importance and value of meetings of similar character, Mr. Weyerhaeuser echoed the endorsement given these meetings by General Eisenhower and many prominent businessmen. It was the hope of many attending the Fort Lewis presentation that sufficient interest will be aroused in other regional industrial centers throughout the country to repeat and renew this vital liaison between military and industrial leaders through the media of future "Industry-Army Days."

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MILITARY GOVERNMENT

(Continued from page 46)

of one ounce of fatty acids per person per month in the U.S. Zone.

Every one of the criticisms of our policies and activities can be answered as in the two cases cited above. Perhaps we were too slow in accomplishing our objectives, but I hope I've covered enough of the difficulties involved to explain such delays as did occur. Germany is still in bad shape economically, and unless she is administered as an economic unit, I see no solution for the next two or three years but continued financial support by the Western Nations.

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Join the CHEMICAL CORPS ASS'N

★ WHAT THE ASSOCIATION DOES:

The members of this Association, mindful of the vital importance of chemical warfare in the field of national defense, have joined together as a patriotic obligation to preserve the knowledge derived from their war experiences and to encourage improvements in science as applied to the Chemical Corps. The objects of this Association, therefore, are to sponsor new developments designed to increase the efficiency of chemical warfare means, to collect and disseminate useful knowledge with respect to chemical warfare and related subjects, to foster a spirit of good will and cooperative endeavor among its members and with industry, and to perpetuate the friendships, memories and traditions growing out of their service with the Chemical Corps. The members of this Association and its constituent local Chapters are mutually pledged to the furtherance and promotion of these objects.

(See article in this issue on Association objective)

★ WHO IS ELIGIBLE FOR MEMBERSHIP:

Any person who is or may be assigned or detailed to duty with or in the Chemical Corps, whether as officer, warrant officer, enlisted man or civilian employee, or who has been honorably discharged from such duty, and any person interested in the promotion of chemical warfare preparedness for national defense, may upon approval of the Executive Committee and payment of the annual dues hereinafter specified become a Regular member of this Association.

DO IT NOW!

If you are not now a member, fill in this application and mail it today.

TO: CAPTAIN JOSEPH SCHWIMER, Secretary, Chemical Corps Association
Room 205, 1128 Fifth St. N.W., Washington 1, D. C.

I hereby apply for membership in the CHEMICAL CORPS ASSOCIATION. Inclosed herewith is check or money order in the sum of:

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Of the sum remitted for dues, \$2.00 is for the annual subscription for the Chemical Corps Journal, and \$.50 is for the annual subscription for the Chemical Corps News.

I am a citizen of the United States of America with a deep sense of the obligation of every citizen to devote himself unstintingly to the cause of our nation's defense whenever the need arises. I have a particular interest in the Chemical phase of national defense.

Military affiliation or CWS activity, if any, in World War II _____

Name _____

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City _____

Shipment of Chemical Munitions from Hawaii

A shipment of chemical munitions, including 4.2 CG shell, 4.2 H shell, 1000 pound and 500 pound CG bombs, CN grenades, 4.2 HE shell, 4.2 propellant, various smoke generators and fire starters was loaded aboard the USAT Tom Trainor at West Loch, Oahu, Territory of Hawaii, during the early part of June. The loading was supervised by Lt. Col. Fred J. Delmore and members of the 14th Chemical Battalion stationed at Oahu. The ship was secured and sailed 18 June 1947 bound for Seattle, Wash.

As is customary, this shipment was escorted by a Chemical Corps detail of six enlisted men with 1st Lt. Roy F. Epperson in command. This detail was completely equipped with protective clothing, testing equipment and decontamination material to meet any emergency which might be encountered while at sea. To insure safe transit, this detail made daily tests of the cargo throughout the voyage. The ship anchored off Bangor, Wash., 29 June 1947 after a very successful voyage.

To insure the safe unloading of the ship, Major Charles H. McNary, Office Chief, Chemical Corps, and Captain William L. Phillips, along with four other officers and 17 enlisted men from the Technical Escort Detachment, Army Chemical Center, were assigned to give technical advice and assistance in carrying out the project. The Corps furnished necessary protective equipment for all workers and the decontaminating material to meet any emergency. Trained Chemical Corps personnel on decontamination operations and disposal work were included in the group.

The unloading of the USAT Tom Trainor became a joint Army-Navy project inasmuch as the Seattle port has no facilities to unload chemical munitions, so an agreement was made with the Navy to use their ammunition port at Bangor, Wash. The necessary transfer of funds to the Navy for use of their civilian personnel was accomplished by the Seattle port.

After giving basic training in toxic munition handling to the civilian stevedores and Navy personnel at the port, unloading operations were started 14 July. On 18 July, during the unloading program, a joint Army-Navy inspection team boarded the ship and checked the entire project to witness the feasibility of a joint Army-Navy operation.

As the ship was unloaded, munitions were stowed in box cars and dispatched to suitable depots, escorted by members of the Technical



Escort Detachment. The unloading was completed on 4 August without an accident.

The complete cooperation of the Army and Navy personnel involved made possible the carrying out of the mission without an unfavorable incident and at a marked savings to the Government.

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The Secretary's Corner

By JOSEPH SCHWIMER
Secretary-Treasurer

The self-complacency of the majority of true Americans has put our country in a dangerous position, and I often wonder just what we can do about it. I find it difficult to understand why those millions of men and women who served in the Armed Forces and those millions who left their homes to wander into industry, now fail to participate in the task of military and scientific preparedness.

Very few seriously study the maneuvers of the State Department, and even a smaller group, fail to study the problems confronting the military.

As a former newspaperman and public relations director, my contacts in the field are varied and many. I take time out to sit down here in Washington and talk with the veteran newspapermen, columnists and public relations biggies. I learn what is going on behind the scenes and at the same time know what news is important, but which does not appear in print.

Just before Labor Day, at the National Press Club, I talked to three top-flight newspapermen. They were disturbed. One said: "We're trying to win over some 50 nations by pouring in millions of dollars. If this keeps up we'll have them on our permanent relief rolls and the minute we drop them, they'll call us every name under the sun, and eventually, join arms with any enemy who declares war upon us. What we should have done was to put our cards on the table after the capitulation of Germany and Japan and demanded right then and there, while we had the power, that an immediate and orderly occupation of enemy territories be undertaken, but that the United States will be the boss."

I thought for a moment and asked: "How could we accomplish that when back home every isolationist society began clamoring for our boys and girls to come back home?"

The columnist had the answer. He pointed out that we could have bluntly said that we had the most powerful Army, Navy and Air Force, and would maintain these arms until all differences were settled. The United States would furnish the food, clothing and essentials for all human beings, but no cash, the columnist said, and then and there, we would have settled the arguments that are now clogging the channels of negotiations.

What do you think?

Considerable interest in the Association is rapidly spreading among industry. We have had many inquiries concerning our second annual meeting at Edgewood, particularly about the German equipment on exhibit. Your Association will assist anyone in obtaining clearance at the Army Chemical Center to see this exhibit upon application. New Group members include Bakelite Corp., U. S. Rubber Company and the H. K. Ferguson Co. We wish to urge every Chapter to invite local industries to join as our future program involves cooperation with the Army and Navy Munitions Board and industry will play an important part. So let's have that assistance.

We regret that a few of our members have failed to renew their memberships. If this is because they failed to receive notice that their membership had expired, we hope that they will renew without the statement of dues. We have undergone a drastic change in accounting procedure and therefore, it is possible that the notice has gone astray.

We urge every Chapter to contact all members to learn whether they have renewed their individual memberships. We will have the complete card file of all members ready soon. Each Chapter will receive the cards for immediate reference, and action.

Many inquiries have been received concerning another Industry-Army Day. Our President is mulling over the matter and all those who feel this is an annual must are invited to send in their comments. We expect the 1948 session to take place in New York, but not until the new Chief of Staff is in office.

Within the near future, we hope to be in a position to give you some facts about the future course of the Chemical Corps. Right now it would be purely speculation to tell you some facts, as decisions change over night. But we know that some important functions will be ours and we ask you to be patient in our second year of existence. We know you will not regret waiting.

We cordially invite our industrial members to send us stories about their war-time achievements; difficulties entailed in the conversion to peacetime enterprise and any material they feel is of importance to the *Chemical Corps Journal*. The first in a series of these articles appears elsewhere in the *Journal*.

(Continued on page 64)

CHAPTER NEWS

HUNTSVILLE CHAPTER

The Huntsville Arsenal Chapter is really going to town.

The July meeting, held at the Officers' Club, was a humdinger with Col. Sterling E. Whitesides, Jr., Commanding Officer, keeping the members in stitches with his remarks, in a humorous vein of course, on the "perils of a Desk Soldier." He reviewed the conditions and effects of the war on Japan and gave an interesting account of the customs of the Japanese people.

Membership is rising and our monthly meetings are going to get better as the Fall and Winter rolls around. We have some rare talent at the arsenal, including two top-notch singers, Miss Jane Pitman and Nick Flood, a local chemical engineer, whose singing ability is well known hereabouts.

Our Chapter President, Capt. Harper, has left the arsenal to accept a position with a local firm and he reports considerable interest in the Association by members of many firms in the area, so we're going to put the Association over the top this year.

Nice going, Huntsville.

JAPAN CHAPTER

The Japan Chapter (No. 27) held a meeting on 8 July 1947 at the Di Iti Hotel, Tokyo, for the purpose of electing permanent officers. The following were elected:

President, Lt. Col. M. Q. Dannettell, 10th Cml. Base.

Vice President, Maj. O. V. Keller, GHQ, FEC.

2nd Vice President, Captain A. G. Bearden, Hq. 8th Army, G4.

Secretary-Treasurer, W/O C. R. Carson, 90th Cml. Mortar Co.

Board of Directors: Lt. Col. K. S. White, Hq. I Corps; Maj. W. C. Behrenberg, Hq. IX Corps; Maj. Theodore Mohr, Hq. 25th Inf. Div.; Capt. E. J. Johnson, 10th Cml. Base Depot, and M/Sgt. J. H. Shultis, 10th Cml. Base Depot.

According to Col. Dannettell, every effort is being made to interest and secure a 100 percent membership of all officers, former officers, enlisted personnel and employees of the Chemical Corps. Regular meetings are scheduled for the Fall and Winter and a report of activities will be sent in regularly for publication in the *News* and *Journal*.

PHILIPPINE CHAPTER

The Philippine Chapter of the Chemical Corps Association held its monthly meeting on 12 July 1947 at the Gregory Terrace Officers' Club in the Philippine University Area, Quezon City, Philippines. The meeting was called to order at 1830 hours by the president of the chapter, Lt. Col. Clarence B. Drennon, Jr. Several business matters were taken up and acted up and the plans for the future of the chapter were discussed.

After the meeting the members enjoyed a dinner of roast turkey with all the trimmings.

The guest speaker at the meeting was Dr. Amando Clemente, who is President of the Chemical Society of the Philippines. Dr. Clemente's subject was "The Future of Chemical Industries in the Philippines." Dr. Clemente stated that there is a great need for chemical industries in the Philippines. Before the war, according to Dr. Clemente, there was practically no chemical industry in the islands. Because of the lack of equipment and various chemicals, their research work had been greatly held up.

Dr. Clemente expressed his desire for American capital to develop chemical industries in the Philippines due to the fact that they have such extensive natural resources that as yet are untouched.

On August 16, upon the invitation of Dr. Clemente, President of the Chemical Society of the Philippines, Lt. Col. Clarence B. Drennon, Jr., Chemical Officer, PHILRYCOM, and President of the Philippine Chapter of the Chemical Corps Association, spoke at a meeting of the Chemical Society of the Philippines.

Prior to the meeting Colonel Drennon was entertained at lunch at the Manila Hotel by Dr. Clemente and other officials of the Chemical Society of the Philippines. After lunch a meeting was held at the Philippine General Hospital, Taft Avenue, Manila. The subject of Colonel Drennon's talk was "Military Science for Peace."

MEETING OF RESERVE OFFICERS AND CHEMICAL CORPS ASS'N

The informal "get-together" was begun at 1730 in the "Roundhouse" of the Fort Shafter Officers' Club, APO 958. After an hour of friendly discussion, a delicious steak dinner was served to all present.

The business meeting was opened at 1930 by Lt. Col. Fred J. Delmore, Chemical Officer, AGFPAC, APO 958. Colonel Delmore set forth the aims, purposes and goals of the Hawaiian Chapter of the Chemical Corps Association. He discussed the possibility of obtaining a Chemical Corps research contract for Oahu and pointed out the advantages of having such a contract in this area. He then urged all reserve and active duty Chemical Corps officers to join the Association. Colonel Delmore then introduced the president of the Hawaiian Chapter of the Chemical Corps Association and a National Director of the Association, Col. Edouard R. L. Doty.

Colonel Doty gave an excellent short talk emphasizing the fact that the Chemical Corps has long since passed the "one-weapon" stage and is now extending into all phases of war. He then proceeded to give a brief outline of the tremendous facilities and means of experimental research in scientific fields which are available on Oahu presently from the sugar and pineapple industries. The advantages of tying the Chemical Corps in with these great industries were pointed out. Colonel Doty set forth the following four projects as his suggestions for future development by the Chemical Corps Association:

1. Experimentation in and development of vegetable killers.
2. A study of bacteriological incendiary and atomic warfare on the civilian population. It was explained that the productive capabilities and the general morale of the civilian population have a tremendous effect on the fighting capabilities of any country. It was pointed out that an organized civilian population is essential to a well-prepared country. Colonel Doty suggested the organization of a Board of Directors for a study of civilian training and organization.
3. The recruitment of alert company grade officers for the Chemical Corps in the Hawaiian Islands.
4. Set up and operate a chemical laboratory company from volunteer civilians. This organization would be a skeleton unit and would serve as a nucleus for a large, efficient, wartime laboratory.

Colonel Doty stated that the four projects mentioned were recommended to the National Headquarters of the Chemical Corps Association for further consideration. The meeting was then thrown open to general discussion, which included such points as:

1. The fact that "lean years" are ahead for the Army and that already public opinion

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Isopropanol
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Butanol

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Acetic acid—from process residues and solvent recovery
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Propionic acid
Butyric acid
Stearic acid

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Methyl acetate
Ethyl acetate
Butyl acetate
Vinyl acetate
Dibutyl phthalate

KETONES

Acetone
Methyl ethyl ketone

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Acetaldehyde
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Furfural

GLYCOLS

Ethylene glycol
Butylene glycol

ETHERS

Ethyl ether
Isopropyl ether

PHENOLS

Phenol
Naphthol

HYDROCARBONS

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Styrene
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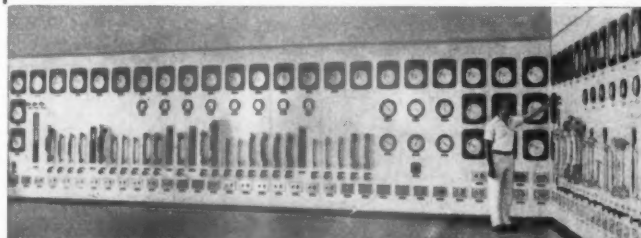
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Hydrogen Peroxide C. P. 30%	H_2O_2 by weight
Hydrogen Peroxide 35%	H_2O_2 by weight
Sodium Carbonate Peroxide	$2 Na_2CO_3 \cdot 3 H_2O_2$
Zinc Peroxide 55%	ZnO_2
Acetyl Peroxide in Dimethyl Phthalate	$(CH_3CO)_2O_2$

Detailed description and laboratory samples of any Becco Active Oxygen Chemical will be sent on request.



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strongly disfavors increased appropriations for the military services.

2. The importance of bringing in local industrial and chemical personnel to present the civilian and industrial aspects of chemistry.

It was then decided that regular monthly meetings would be held in the future, after which the meeting was adjourned.

EUGENE E. MONK, Capt.
Hawaiian Chemical Corps Ass'n

BALTIMORE CHAPTER

The Baltimore Chapter is canvassing its members to determine the type of meetings they prefer. According to Paul Bauman, President, and Howard Williams, Publicity Director, the Chapter is preparing for a busy Fall and Winter.

Russell Greer, Vice President of the Pemco Corporation, and a member of the Chapter, was elected Maryland Area Director, and is anxious to recruit new members. Ways and Means are being devised by the officers to increase attendance at the meetings and everyone is urged to send in their answers to the questionnaire recently mailed. Prominent speakers and entertainment are on the agenda for the Baltimore Chapter.

NEW YORK CHAPTER

Preparations for the meetings of the New York Chapter for the Fall and Winter are going full blast, according to Jehome J. McGinty, Chapter President and Charles Stone, Secretary. The first of the meetings will be held at 2 Park Avenue this month and all members are urged to send in their reservations to either Jerry, at Millmaster Chemicals, 551 Fifth Ave., or Mr. Stone, at 280 Broadway, care of Certified Abstracts, Inc.

The Chapter is bending every effort to make New York the most active unit in the Association and Jerry is asking everyone to give him a hand. Some important discussions will take place and Signal Corps pictures of the Normandy invasion will be shown.

The day is 15 October 1947; place, 2 Park Avenue; time, 6 P.M. The Chapter is eager to get started with a bang, so let's all turn out.

WASHINGTON, D. C. CHAPTER

The Washington Chapter fires its first Fall barrage on 18 October at 6 P.M. at the Shelter Rock Creek Park, with a buffet supper, movies, dancing and entertainment, John J. Stockett, President, announced.

Some 300 tickets are being printed for this big get-together, and a big turnout is expected. Res-

ervations can be obtained by calling National Headquarters at National 2509; Miss Helen Gravenkamp at Republic 6700, ext. 5924; Wayne Fort at the Office of the Chief, Chemical Corps, or Mr. Stockett. Tickets are \$2.00 each and includes the works.

The sudden illness of Maj. Ozzie Varela put a big dent into the Committee's activities, but Oz is helping out from the bedside at Walter Reed Hospitaal. We all wish him a speedy recovery, and hope that he can be with us on 18 Oct.

Assisting in the arrangements are Bob Norman, Miss Gravenkamp, Wayne Fort, John Stockett, Don Rogers and all the Washington members. Get your reservations in early. A map showing the route to the Shelter via bus or automobile, will be distributed to everyone. This meeting will be your big opportunity to get acquainted, and a chance to talk over future meetings.

ROCHESTER CHAPTER

A complete Fall and Winter program has been set up for the Rochester Chapter, Ernest Mohr, President, stated. Speakers on the agenda include Col. John Wood, Chief, Medical Division, Chemical Corps, and L. Wilson Green, Army Chemical Center. All Chapter members will be notified of meeting dates.

Meetings will be held in the auditorium of the Rundel Memorial Library. Those wishing to attend these meetings are urged to write to Mr. Mohr, 129 Montclair Dr., Rochester 12, N. Y.

EDGEWOOD CHAPTER

Plans for the big meeting of the Edgewood Chapter were completed and the date set was 3 October. Brig. Gen. Edward Montgomery and Col. William Creasy are the scheduled speakers.

A membership drive is underway and it is hoped that the Army Chemical Center will have 100 percent membership within a short time.

Harry C. Knight represented the Chapter at the Board of Directors meeting of the National Association held at the Cloud Club, New York City, on 18 September. He will give us a first-hand account of the doings of this important session.

You can expect big doings at the Center.

The Chemical Corps Association is an important element of the Nation's Chemical Defense.

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PROPERTIES

Assay: Diacetyl Peroxide 30% by weight
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Active Oxygen: 4% by weight min
Specific Gravity: 1.18 at 20°C.
Form: Crystal clear liquid, strong odor.
Stability: No decomposition when stored at 5°C.
Flash point (open cup) 45°C.
Decomposition rapid above 70°C.
Solubility: Soluble in most organic solvents.

SUGGESTED USES

Organic Synthesis: Source of free radicals. Preparation of dicarboxylic acids, etc.
Plastics, Resins: Free soluble catalyst for bulk polymerization.
Paints, Varnishes: Modification of oils.
Rubber, etc.: Vulcanizing agent, curing agent.
General: Decolorizing agent.

AVAILABILITY

Becco Acetyl Peroxide in Dimethyl Phthalate is now available in commercial quantities.

A FEW OTHER BECCO PRODUCTS

Hydrogen Peroxide 27.5% by weight
Hydrogen Peroxide C. P. 30% by weight
Hydrogen Peroxide 35% by weight
Hydrogen Peroxide 90% by weight
Sodium Carbonate Peroxide 2 Na₂CO₃·3 H₂O₂
Zinc Peroxide 55% ZnO₂

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October, 1947

THE SECRETARY'S CORNER

(Continued from page 59)

Doings at National Headquarters involve considerable work. Your Executive Committee meets regularly and takes up important administrative details. We hope that beginning in January, reports of our various committees will be available for your digestion—or indigestion.

We require assistance in the advertising department, and your Secretary cordially invites suggestions concerning ways and means to increase this method of making our magazine self-sustaining.

Our membership is growing. Chapters are now reporting that Fall and Winter meetings are being arranged with prominent speakers and entertainment features. We particularly want stories of your programs and meetings, together with pictures you feel should be in the *Journal*. We have asked many times for pictures of chapter officers, and hope they come through soon.

Many questions have arisen over the Military Affiliation program in industry, but we do not wish to comment about this at present. There are many wrinkles in it, and we hope the military will iron them out before industry gets discouraged.

Don't forget we need Chapter news. Appoint a reporter in your chapter and make him or her responsible for the transmittal of information for the *Journal* and *News*. These publications are yours to keep rolling. All copy should be in our hands by the 10th of the month preceding date of publication. So let's go and make 1948 the biggest year yet.

Training Plans of the 130th Chemical Group

(Continued from page 23)

posite Group must not be considered merely a replacement pool and subject to the same ill-advised lack of interest as was shown in replacement pools during a large part of World War II. Personnel should have a clearly defined sense of responsibility to a particular job and should thereby be inspired to attain professional competence in that job.

The program outlined above is flexible and will be changed as experience indicates change to be desirable. If current doctrine can be taught, the experience of officers with rich war service should from the War Department's point of view be a valuable source of improvement of doctrine. Embarking on this program has involved taking the bit into our own teeth, but if we had not done this, the alternative would have been, in our judgment, to mark time and, in the course of marking time, to suffer further loss of interest and valuable personnel.

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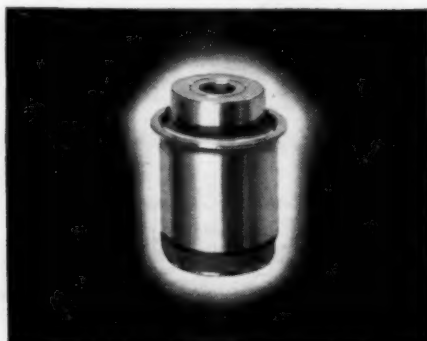
if gasoline were sold in sacks...

it would be easy to stencil everything you'd like to know about its quality and ingredients right on the sack. However, gasoline is generally delivered direct to your gas tank, sight unseen. Oil companies can't label each gallon. That's why they put the familiar yellow-and-black "Ethyl" emblem on their pumps to show that they have improved their best gasoline with "Ethyl" antiknock compound. This famous ingredient, which improves engine power and performance, is made by the Ethyl Corporation, Chrysler Building, New York 17, New York.

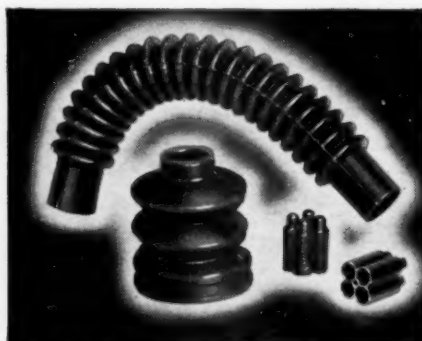
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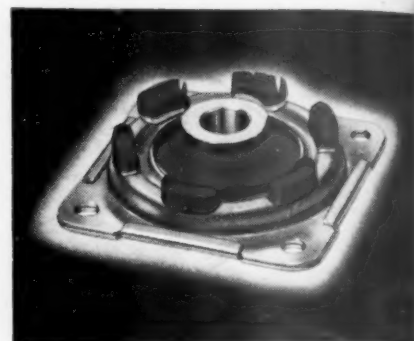
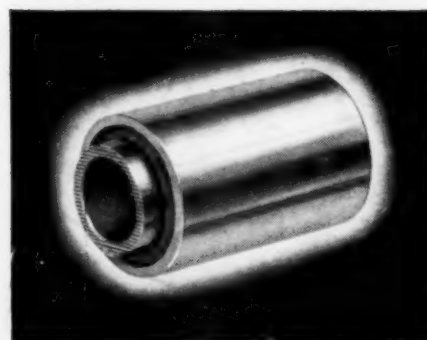
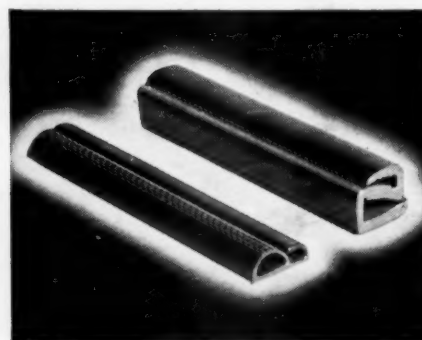


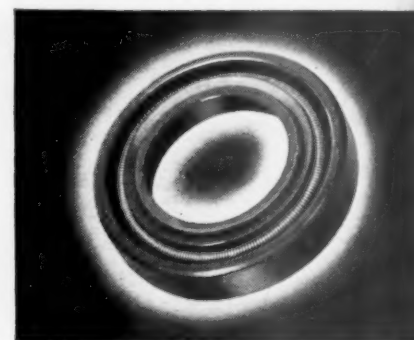
PLATE MOUNTS of any metal and rubber, for vibration isolation in aircraft, radio, electrical equipment, instruments.



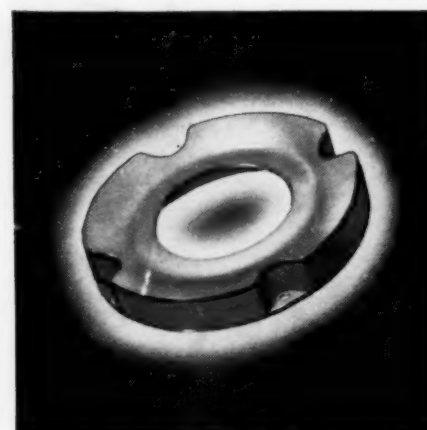
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RUBBER-bonded-to-metal parts of all kinds, made to specification. In ROTOL drive, shown at right, rubber is bonded to metal.



SHOWN HERE are exploded and assembled views of ROTOL gearbox drive. On many parts, tolerance was held to ten-thousandths.

ROTOL gearbox drive for Rolls-Royce aircraft engine, engineered by General. Rubber coupling cushions starting torque and absorbs torsional vibrations due to engine impulses, minimizing metal shaft fatigue. A notable example of General's skill in precision engineering.

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